

APPENDIX H.

TO

SECOND REPORT OF COMMITTEE

UPON

THE FEVER HOSPITAL

AND

MUNICIPAL IMPROVEMENTS:

CONTAINING

PAPERS (FORMING A CONTINUATION OF THOSE PRINTED IN APPENDIX TO APPENDIX G.)
SELECTED FROM THE RECORDS OF THE COMMITTEE APPOINTED TO CONTROL AND DIRECT THE EXECUTION OF LIEUTENANT J. A. SCHALCH'S PLAN OF A LINE OF CANAL FROM THE RIVER HOOGHLY TO KOOLNA, TO ALLOW OF AN EASY AND SAFE COMMUNICATION BETWEEN THE UPPER AND EASTERN PROVINCE AND CALCUTTA BY WATER, THROUGH THE SOONDURBUN PASSAGALS, DURING THE RAINY SEASON.

CALCUTTA :

Bishop's College Press.

1848.

APPENDIX, (H)

Index.

Papers (forming a continuation of those printed in Appendix to Appendix G. selected from the Records of the Committee appointed to control and direct the execution of LIEUTENANT J. A. SCHALCH's Plan of a line of Canal from the River Hoogly to Koolna, to allow of an easy and permanent communication between the Upper and Eastern Provinces of India and Calcutta by Water through the Soondurbun passages and Salt Water Lake during the Dry Season.

	PAGE.
No. 1. Letter from Mr. Secretary Mackenzie, dated 20th March 1823, to W. Paton, Esq. 2nd Member Board of Revenue L. P. H. Shakespear, Superintendent Police, C. R. Barwell, Magistrate Suburbs of Calcutta, and Captain W. Swinton, Superintendent Public Buildings L. P. appointing them a Committee to control and direct the execution of Lieutenant Schalach's Plan of a line of Canal from the River Hoogly to Koolna, and transmitting a Copy of a resolution passed by the Government this day. (For this resolution Vide Appendix to Appendix G. Paper marked F 1.)	Territorial ment, Reven sultation, N 20th March 1
No. 1½. Letter from Secretary Board of Revenue, dated 14th February 1823, to Mr. Secretary Mackenzie, transmitting the Paper marked No. 1½. a. and No. 1½. a.(1)	Ibid, No February 18
No. 1½. a. Letter from the Collector of the 24-Purgunnahs, dated 28th January 1823, to the Secretary to the Board of Revenue, relative to the necessity of excavating the obstructed passages of the Balliaghatta Canal.	NOTE.— Papers are n corded in th nal Commi Proceedings. J. B
No. 1½. a.(1) Estimate of the expense of clearing the obstructed passages of the Balliaghatta Canal.	
No. 1½. Letter from Mr. Secretary Mackenzie, dated 27th February 1823, to Lieutenant Schalach, transmitting the above Papers marked No. 1½. to No. 1½. a.(1) inclusive, and requesting him to report on the expediency of clearing the above Canal.	Territorial. partment. H quo Consulta No. 5. 27th bruary 1823.
No. 2. Letter from Mr. Secretary Mackenzie, dated 10th April 1823, to Canal Committee, transmitting the Paper marked No. 2. a. and No. 2. b.	Ibid, No. 20. April 1823.

Territorial Department, Revenue Consultation, No. 21, 10th April 1823.

No. 2. a. Letter from Lieutenant Schalch, dated 5th April 1823, to Mr. Secretary Mackenzie, in reply to his letter of the 27th February 1823, (marked No. 1½.) states that if the head of the Eastern or Balliaghatta Canal were under the influence of the Tides from the Soonderbuns, which it could be made to be by a bund, to prevent the Soonderbun Tide spreading over the Lake, of 4 feet by 8 feet broad from the head of the Balliaghatta Canal to Bahminghatta on the Eastern side of the Lake, a distance of 6 miles, which at 10 per 100 square feet, will come to Sa. Rs. 6,331, a considerable amount of the filth of the Town, which is now deposited in the Canal, would be carried into the deep Soonderbun passages of the Eastern Lake; and that from Balliaghatta end of Entallee Canal to 7,800 feet into the Lake is dry at low water, and only partially covered during the flood-tide, that beyond the above distance the Lake is deep and broad, and forms a passage for the Soonderbun Tide, and that if the bund above referred to, were made, it would probably raise the water in the Balliaghatta Canal about 3 feet.

Ibid, No. 22. 10th April 1823.

No. 2. b. Letter from Mr Secretary Mackenzie, dated 23d April 1823. replying to Lieutenant Schalch's letter, (marked No. 2.(a)) authorizing the measures proposed by him.

Ibid, No. 12. 23rd April 1823.

No. 3. Letter from Secretary to Government, dated 23d April 1823, to the Members of the Canal Committee, transmitting the Paper marked II⁽¹⁾ printed in Appendix to Appendix G.

Canal Committee's Proceedings, Vol. 1, page 75.

No. 4 Letter dated 14th May 1823, from the Secretary to the Canal Committee to Superintendent of Canals, transmitting the Resolution of Government of the 23rd April 1823, relative to the Supplementary Report of the Special, or Lieutenant Schalch's Committee, on the construction of the Canal to Channel Creek and Diamond Harbour, and requesting his early attention to the 8th and 9th Paragraphs of the above Resolution.

Territorial Department, Revenue Consultation No. 10, 12th June 1823.

* This Minute Survey is possibly amongst the Original Proceedings of the Canal Department.—J. M.

No. 5. Letter from Superintendent of Canals, dated 15th May 1823, to Canal Committee, stating that he had completed a Minute* Survey of Tolly's Nullah, when he received the Resolution of Government of the 23rd April instant, which requires that Tolly's Nullah should be considered solely with reference to the Diamond Harbour and Saugor Canal, and requesting time to furnish a Report.—(See Letter of Government, dated 12th June 1823, marked, No. 10 and No. 11.)

Canal Committee's Proceedings, Vol. 1,

No. 6. Further reply by Superintendent of Canals, dated 19th May 1823, to the Secretary to the Canal Committee's letter of the 14th May 1823, relative to Tolly's Nullah. &c.

- No. 7. Letter from Canal Committee, dated 27th May 1823, to Mr. Secretary Mackenzie, transmitting the Paper marked No. 5.—
(See Paper marked No. 10.)
- No. 8. Letter from Canal Committee, dated 10th June 1823, to Government, transmitting extracts from Superintendent of Canals' letter of the 19th May instant (Vide Paper marked No. 6.) with the opinion of the Canal Committee thereon. For answer to this Vide Paper marked No. 10.
- No. 9. Letter from Canal Committee, to Mr. Secretary Mackenzie, dated 10th June 1823, laying before the Government their intended Plan of procedure in respect to purchasing Land, &c. for the proposed Circular and Eastern Canals.—See Paper marked No. 12.
- No. 10. Letter from Mr. Secretary Mackenzie, dated 12th June 1823, in reply to Committee's letter of the 27th May instant, states that what is done to *Tolly's Nullah* must be done with *reference* to the *Saugor Canal*.—See Paper marked No. 5. ..
- No. 11. Letter from Secretary to Government, dated 12th June 1823, to Secretary to Canal Committee, stating that the Governor General in Council approves the suggestion that the *Saugor* and *Eastern Canal* should both be commenced on after the ensuing rainy season.
- No. 12. Letter from Secretary to Government, dated 19th June 1823, approving the Plan of Procedure proposed by the Committee.—See Paper marked No. 9.
- No. 13. Letter from the Secretary to the Canal Committee, dated 24th June, to Superintendent of Canals, requesting his sentiments on the subject of straightening the line of Canal between *Bahminghatta* and *Chiltabariah*.
- No. 14. Letter from the Acting Collector of Jessore, dated 24th July 1823, to Secretary to Canal Committee, transmitting the Paper marked, No. 14. a.
- No. 14. a. List of the Landholders, through whose Estates the proposed Canal to *Koolna* is to pass.
- No. 15. Letter from Superintendent of Canals, dated 25th July 1823, to Canal Committee in reply to their Letter of the 24th June 1823, marked No. 13. relative to straightening the line of Canal between *Bahminghatta* and *Chiltabariah*, states that the present passage from *Tardah* to the *Salt Water Lake*, which is extremely disagreeable, in consequence of its lying for the

Territorial Department, Revenue Consultation, No. 9. 12th June 1823.

Canal Committee's Proceedings, Vol. 1. page

Territorial Department, Revenue Consultation, No. 16. 19th June 1823.

Canal Committee's Proceedings, Vol. 1. page 107.

Territorial Department Revenue Consultation, No. 12. 12th June 1823.

Ibid, No. 17. 11 June 1823.

Canal Committee's Proceedings, Vol. 1. page 110.

Ibid, Vol. 1, page 152.

Ibid.

Territorial Department, Revenue Consultation, No. 37. 21st August 1823.

greater part, through Jungle, and from the strong currents which set down it from the Lake during the rains, will be avoided by the proposed alterations; and describes the nature of the ground about Poorooh Dhappa and the Eastern Lake...

Territorial Department, Revenue Consultation, No. 37, 21st August 1823.

- No. 16. Letter from the Canal Committee, dated 30th July 1823, to Mr. Secretary Mackenzie, transmitting the Paper marked No. 15.

Canal Committee's Proceedings, Vol. 1, page 170.

- No. 17. Letter from the Commissioner of the Soonderbunds, dated 6th August 1823, to Secretary to Canal Committee, transmits the Paper marked No. 17. a. and states that his jurisdiction does not extend beyond the Western Bank of the Juboona River

Ibid.

- No. 17. a. List of the Talookdars or Landholders, to whom the Commissioner of the Soonderbunds has issued Perwannahs.

Territorial Department, Revenue Consultation, No. 38, 21st August 1823.

- No. 18. Letter from Secretary to Government, dated 21st August 1823, to Canal Committee, approving of their suggestions for straightening the line of Canal referred to in Papers marked No. 13. No. 15. and No. 16. inclusive.

Ibid, No. 16. 6th November 1823.

- No. 19. Letter from Superintendent of Canals, dated 6th October 1823, to Canal Committee, relative to the cost of clearing Jungle, excavating, and price of Labour, &c.

- No. 20. Letter from Canal Committee, dated 22nd October 1823, to Superintendent of Canals, approving generally of his suggestions, &c. contained in his Letter of the 6th October 1823, marked No. 19.

- No. 21. Letter from Canal Committee, dated 25th October 1823, to Secretary to Government, transmitting the Papers marked No. 19. and No. 20.

Canal Committee's Proceedings, Vol. 2, page 5.

- No. 22. Letter from Captain J. A. H. Schalch, dated 25th October 1823, to the Secretary to the Canal Committee, reporting that to avoid delay in carrying into effect the orders of Government of the 10th of April 1823, relative to clearing the head of the Eastern or Ballaghaut Canal and bunding in a passage through the Salt Water Lake, he has entertained an European Overseer to direct the labourers; that he, Captain Schalch, is at present engaged in marking out the direction of the intended passage through the Lake; that when that work is completed he will commence excavating the passage; that he has also directed a small temporary Bungalow to be erected on the borders of the Lake for the residence of the Overseer, and Hoonglah Huts for the Labourers.

- No. 23. Letter from Secretary to Government, dated 6th November 1823, to Canal Committee, approving of the instructions of the Committee to the Superintendent of Canals, and sanctioning an advance of Rs. 50,000 per mensem for the Koolna Canal.
- Territorial Department Revenue Consultation No. 18, 6th November 1823.
- No. 21. Letter from Superintendent of Canals, dated 12th December 1823, to Secretary to the Canal Committee, transmitting the Paper marked No. 24. a.
- Canal Committee's Proceedings, Vol. 2, page 64.
- No. 24. a. Minute by Captain J. A. H. Schaleh on the effect the opening of the Hoseinabad Canal will probably have on the manufacture of Salt in its vicinity, and shewing no loss will arise to Government from opening the above Canal.
- Ibid, page 65.
- No. 25. Letter from Secretary to Government, dated 5th March 1824, to the Secretary to the Canal Committee, transmitting the Papers marked No. 25. a. to No. 25. b. inclusive.
- Ibid, page 139.
- No. 25. a. Letter from Board of Customs, Salt and Opium, dated 16th February 1824, transmitting the Paper marked No. 25. a $\frac{1}{2}$, and stating that they do not think it advisable to grant the enhancement of one anna per maund on the price of the Salt made in the New Calaries.
- Ibid.
- No. 25. a $\frac{1}{2}$. Letter from C. R. Barwell, Esq. dated 12th February 1824, to the Board of Customs, Salt and Opium, stating that by closing the Koolcagong at Ballygunge to secure the Jaboona River from the admission into it of too great a body of Salt Water, the operation of one hundred and fifty-two Calaries on the Northern Bank of the projected Canal will be destroyed, and that about 33 more will be rendered useless in the event of the Ghobra Khaul being bunded; but he concurs in the opinion of the Superintendent of Canals, that all objections may be obviated by removing the Calaries to the Southern side of the Canal.
- Ibid, page 141.
- No. 25. b. Letter from Secretary to Government, dated 5th March 1824, to the Board of Customs, Salt and Opium, acknowledging the receipt of their letter of the 16th ultimo, relative to the measure proposed by the Superintendent of Canals for opening the Canal in Hoseinabad and Busserah, that on a consideration of these Papers, His Lordship in Council is satisfied, that the temporary and particular inconvenience likely to result from the closing of the Koolnahgong, and as eventually proposed, of the Gobrah Khaul, is not of sufficient moment to cause any hesitation in the execution of these works if found necessary for the purposes explained by Captain Schaleh.
- Ibid, page 143.

Territorial Department Revenue Consultation No. 13. 19th March 1824.

No. 26. Letter from Secretary to Government, dated 19th March 1824, to Secretary to Canal Committee, transmitting Regulation I. 1824, Vide Paper marked No. 26. *a.* and vesting the Committee with the powers provided in Section 3, Clause 2 of said Regulation.

No. 41. 30th July 1824.

No. 26. *a.* Draft of a Regulation for rescinding Regulation IV. 1813, for declaring the rates of Toll to be levied on Boats, Rafts, Timbers, and the like passing through the Bhogaruthee, Jellinghee, Usamuttee, Mattabangah, and Choornee Rivers, and for providing for the better collection of the Toll, and for the secure Navigation of the aforesaid and other navigable Rivers. . .

No. 37. ditto.
* Since ordered to be commenced upon—See Extract of a Dispatch (marked No.—) dated 11th July 1827, of the Court of Directors. The subject appears to have been overlooked.—J. M.

No. 27. Letter from Secretary to Government, dated 30th July 1824, to Canal Committee, transmitting the Papers marked No. 27. *a.* and directing that the Canal to *Diamond Harbour and Channel Creek be suspended, the Kidderpoor Bridge to be completed, and the Canal to Coolna to be reported on.—Vide Papers marked No. 79½. and No. 79½. *a.*

Territorial Department Revenue Consultation No. 37. 30th July 1824.

No. 27. *a.* Extract from the Proceedings of the Right Hon'ble. the Governor General in Council in the Territorial Department, under date the 23rd July 1824, with reference to the Suspension of all Public Works.

No. 21. 24th December 1824.

No. 28. Report dated 19th October 1824, by Major J. A. H. Schalch, transmitting the Paper marked 28. *a.* reporting the state of the Canals under his charge.

No. 22. ditto.

No. 28. *a.* Report by Captain Taylor, dated 28th August 1824, to Superintendent of Canals upon the Canal to Diamond Harbour and Channel Creek.

Canal Committee's Proceedings, Vol. 3. page 149.

No. 29. Letter from Canal Committee, dated 18th November 1824, to Secretary to Government, with reference to the Paper marked No. 27, transmits the Papers marked No. 28. to No. 29. *b.* inclusive.

Ibid.

No. 29. *a.* Abstract Statement, shewing the quantity and value of ground and buildings purchased by the Canal Committee, since their appointment on the 20th March 1823, to 23rd October 1824, as per Dft. No. 1. to No. 47. inclusive.

Ibid.

No. 29. *b.* Abstract Statement of all sums drawn and expended on account of the Canal Works, from their commencement up to the 31st July 1824.

Territorial Department Revenue Consultation No. 23 24th December 1824.

No. 30. Letter from Secretary to Government, dated 24th December 1824, to Canal Committee, in reply to their Letter of the 18th No.

vember 1824, marked No. 29, states that his Lordship in Council concurs with the Committee in thinking, that the establishment now kept for carrying on the business of the Iron Bridge Department should be continued; that the Survey of the proposed line of the Diamond Harbour Canal appears to have been executed by Captain Taylor in a very satisfactory manner; and that the benefits of that work, or the facilities of executing it have not been overrated; but since the services of Captains Schalch and Baker are not available for the work, it appears expedient to postpone it; that for several reasons, his Lordship prefers keeping the work in the hands of the Government; and any private Society would doubtless labour under much disadvantage if deprived of the services of Captains Schalch and Baker; that the expense incurred for executing the Balliaghat Canal and erecting the temporary Bridge at Kolia is sanctioned; that the early completion of the Channel through the Salt Water Lake is very desirable; and that it is advisable to carry on the general Plan of the Canal to Koolna, though in a modified system, if the services of a competent person, not in the service, could be obtained in place of Lieutenant Prinsep, whose services are required elsewhere.

No. 31. Letter from the Superintendent of Canals, dated 2nd January 1825, to Canal Committee, respecting the state of his account current with the Committee, and stating that he is to quit Calcutta for Chittagong immediately.

No. 20. 23rd April 1825.

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No. 32. Letter from Secretary to Canal Committee, dated 21st March 1825, to Secretary to Government, respecting the outstanding balances in the Canal and Iron Bridge Department; and stating with reference to the Paper marked No. 30. that the Committee have not been able to meet with an uncovenanted officer qualified to undertake the Superintendence of the Eastern Canal works; and adverts to Captain Schalch's death and to the services of Captain Taylor.

No. 19. 28th April 1825.

No. 33. Letter from Secretary to Canal Committee, dated 2nd May 1825, to Secretary to Government, transmitting the Papers marked No. 33. a. to 33. e.⁽¹⁾

Territorial Department Revenue Consultation No. 17 12th May 1825.

No. 33. a. Letter from Captain J. W. Taylor, Assistant Superintendent of Canals, dated 21st March 1825, to Secretary to Canal Committee respecting the obtaining of certain Public Documents from Major Schalch's Executors.

Ibid.

No. 33. b. Letter from Secretary to Canal Committee dated 25th March 1825, to Captain J. W. Taylor, Assistant Superintendent of Canals requesting him to take immediate measures to obtain

Ibid.

all the Public Documents pertaining to the Canal Department now in the hands of Major Schalch's Executors.

No. 33. c. Letter from Assistant Superintendent of Canals, dated 11th April 1825, transmitting the Papers marked No. 33. c.⁽¹⁾ to No. 33. c.⁽³⁾; and stating that there are many private Papers pertaining to Major Schalch's Estate, which it would be advisable to purchase—amongst which is a Plan of a proposed Harbour for Shipping at the Port of Calcutta, and a Plan of a Machine for cutting Piles under water, and a Plan of a Machine for driving Piles.

Territorial Department Revenue Consultation No. 17. 12th 5.

No. 33. c.⁽¹⁾ List of Maps, Plans or Sketches relating to or connected with the Canal and Iron Bridge Departments.

No. 33. c.⁽²⁾ List of Documents and Papers relating to or connected with the Canal and Iron Bridge Departments.

No. 33. c.⁽³⁾ List of the late Major Schalch's Private Journals.

No. 33. d. Letter from Secretary to Canal Committee, dated 20th April 1825, to Assistant Superintendent of Canals, requesting him to submit a list of all the private Papers and Documents which are likely to prove useful, and to mention what would be a fair remuneration to Major Schalch's Estate for the same. ..

No. 33. e. Letter from the Assistant Superintendent of Canals, dated 28th April 1825, to Secretary to Canal Committee transmitting the Paper marked No. 33. e.⁽¹⁾ and stating that Rupees 400 might be considered a fair remuneration to Major Schalch's Estate for his private Papers, above referred to.

No. 33. e.⁽¹⁾ List of the Private Journals of the late Major J. A. H. Schalch.

Canal Committee's Proceedings, Vol. 5, page 55.

No. 34. Letter dated 19th May 1825, from Secretary to Government to Secretary to Canal Committee, transmitting the Papers marked No. 34. a. and No. 34. a.⁽¹⁾

Ibid

No. 34. a. Letter from G. Jessop, Esq., dated 9th May 1825, to Secretary to Government, suggesting a *Railroad to Diamond Harbour* in place of the proposed Canal, and transmitting the Paper marked No. 34. a.⁽¹⁾

Ibid, Vol. 5, page 57.

No. 34. a.⁽¹⁾ Report dated November 20th 1824, to the Committee of the proposed Railway from Cromford to the Peak forest Canal at Whaley Bridge.

Ibid, Vol. 6, page 35.

No. 35. Letter dated 3rd [4th] November 1825, from Secretary to Canal Committee to Lieutenant T. Prinsep, Engineers, Chittagong, requesting his opinion on the following points :—

1. Whether the portions when completed of the Canal to Koolna will prove advantageous, independent of the general Scheme?

2. What local advantages are likely to accrue from completing them?

3. If the completion of them would afford Data to form a judgment of the practicability or difficulty to be anticipated in the execution of Major Schaleh's Plan generally, by shewing the action of the tides in them, in forming deposits, or in acting upon their sides.

4. At what expense the Cuts might be completed.

- No. 36. Letter from Secretary to Canal Committee, dated 4th November 1825, to the President and Members of the Embankment Committee of the 24-Purgunnahs and Zillah Jessore, relative to the unfinished Cuts of the Canal to Koolna.
Canal Committee's Proceedings, Vol. 6, page 39.
- No. 37. Reply by Lieutenant T. Prinsep, dated 13th November 1825, to Secretary to Canal Committee's letter of the 4th November 1825, marked No. 35.
Territorial Department, Revenue Consultation No. 10, 29th December 1825.
- No. 38. Letter from Messrs. Jessop and Co., dated 11th November 1825, to Secretary to Canal Committee, transmitting the Paper marked No. 38. a.
Canal Committee's Proceedings, Vol. 6, page 49.
- No. 38. a. Estimate by Messrs. Jessop and Co. of the expense of a Railway to Diamond Harbour, and also from head of Dhurumtollah Road to Balliaghaut.
Ibid, page 50.
- No. 39. Letter dated 16th November 1825, from Secretary to Canal Committee to Secretary to Government, transmitting the Papers marked No. 38. and No. 38. a.
Ibid, page 60.
- No. 40. Letter dated 16th November 1825, from the Embankment Committee of the 24-Purgunnahs to the Secretary to the Canal Committee, in reply to his letter of the 4th November 1825, marked No. 36.
Territorial Department, Revenue Consultation No. 9, 29th December 1825.
- No. 41. Letter from Secretary to Canal Committee, dated 24th November 1825, to Lieutenant T. Prinsep, stating that the Committee would gladly avail themselves of the offer of his services, to visit the scene of his late operation, but that they are not prepared yet to make an application to Government on that point, and that the Questions contained in the letter of the 4th November instant, refer exclusively to the two Cuts which were commenced under his, Lieutenant Prinsep's, Superintendence.
Canal Committee's Proceedings, Vol. 6, page 61. and 62.
- No. 42. Letter dated 28th November 1835, from the Embankment Committee of the Zillah Jessore, to Secretary to Canal Committee,
Territorial Department, Revenue Consultation No. 9, 29th December 1825.

in reply to his letter of the 4th November 1825, marked No. 36.

No. 10. 24th Dec- No. 43. Letter from Lieutenant T. Prinsep, dated 8th December 1825, to
cember 1825. Secretary to Canal Committee, in reply to his letter of the 24th November 1825, marked No. 41. and replying further to the letter of the 4th November 1825, marked No. 35.

No. 8. ditto. No. 41. Letter to Secretary to Government, (in reply to his letter of the 6th October, instant) from Secretary to Canal Committee, dated 22nd December 1825, transmitting the Papers marked No. 35 to No. 37 inclusive, and No. 40, 42, and 43, and stating, that, for the purpose of ascertaining how far the Cuts already in progress would be useful to the Inhabitants of the surrounding districts, in the event of their being completed, independent of the general Scheme, according to Major Schalch's Plan, at no very considerable outlay, and whether the works might not be done under the Superintendence of the Officers in charge of the embankments, the Canal Committee had addressed letters to the Members of the Embankment Committee for the 24-Pergunnahs and Zillah Jessore.

No. 11. ditto. No. 45. Letter from Secretary to Government, dated 29th December 1825, to Canal Committee, stating that His Lordship in Council has resolved to relieve Major Schalch's Estate from the responsibility of the outstanding balances on account of the Koolna Canal, also that Lieutenant T. Prinsep will be directed to Survey the unfinished Cuts of the Koolna Canal.

Canal Committee's
Proceedings, Vol. 7.
page No. 46 Letter from Secretary to Government, dated 6th April 1826, to Canal Committee, transmitting the Papers marked No. 46. a. and No. 46. b.

Territorial Department, Revenue Consultation No. 23.
19th October 1826. No. 46. a Letter from the Acting Secretary to the Board of Revenue, dated 14th March 1826, to Secretary to Government, transmitting the Paper marked No. 46. b

Ibid. No. 46. b. Letter from the Collector of 24-Pergunnahs, dated 3rd March 1826, to Secretary to Board of Revenue, bringing to the notice of the Board the obstructed state of the Eastern Canal, and transmitting the Paper marked No. 46. b. (1)

Ibid. No. 46. b. (1) Copy of a Report from the Tesheldar of the Canal, stating the extent of work performed by Major Schalch in the Eastern Canal and Salt Water Lake Channel, and asserting that the work executed by Major Schalch was very incommensurate with the outlay on the above works.

No. 24. 19th Octo- No. 47. Letter from Secretary to Canal Committee, dated 14th April
ber 1826.

1826, to the Secretary to Government, stating particulars connected with the work performed by Major Schaleh in the Salt Water Lake Channel and Eastern Canal.

No. 48. Letter from Secretary to Government, dated 14th September 1826, to Canal Committee, stating that Lieutenant Prinsep has been directed to place himself under the orders of the Committee, and requesting the Committee to report what pay and allowances should be given him.

No. 24. 14th September 1826.

No. 49. Letter from Secretary to Canal Committee, dated 19th October 1826, to Superintendent of Canals, requesting of him to state what Plan of operation he would propose to follow in the ensuing season, and pointing out that which to the Committee appears the most advisable.

Canal Committee's Proceedings, Vol. 7. page 166.

No. 50. Letter from Secretary to Government, dated 19th October 1826, to Secretary to Canal Committee, stating that the further progress of the Eastern Canal must only extend to the purchase of the land which may be requisite to ensure its ultimate success, and adverting to the late orders from the Honorable Court of Directors on the subject of Public Works.

Territorial Department, Revenue Consultation No. 26. 19th October 1826.

No. 51. Letter from Superintendent of Canals, dated 26th October 1826, to Secretary to Canal Committee, in reply to his letter of the 19th instant marked No. 49, relative to the general scheme of intended operations during the ensuing season.

No. 36. 29th December 1826.

No. 52. Letter from Secretary to Canal Committee, dated 3rd November 1826, to Superintendent of Canals, in reply to his letter of the 26th ultimo, and the Estimate which accompanied it (marked No. 51.)

Ibid.

No. 53. Letter from Superintendent of Canals, dated 9th November 1826, to Secretary to Canal Committee, transmitting a List of the Additional (308 B : 16 C. : 8 Ch. :) required to be purchased for the Ooltadanga Canal, and stating that the Channel through the Salt Water Lake has been considered in Major Schaleh's Scheme.

Canal Committee's Proceedings, Vol. 8. page.

No. 54. Letter from Secretary to Canal Committee, dated 16th November 1826, to Acting Secretary to Government, in reply to his letter of the 19th ultimo (marked No. 50.) states that the quantity of ground required for the Eastern Canal, in addition to that which has already been purchased, is 388 biggahs, estimated value Rupees 4,65,600.

Territorial Department, Revenue Consultation No. 29. 23rd November 1826.

No. 55. Letter from Acting Secretary to Government, dated 23rd November, 1826, to Secretary to Canal Committee, stating that

Canal Committee's Proceedings, Vol. 8. page.

under the Orders of 19th October last, the Superintendent of Canals will be chiefly engaged in removing the obstructions in the old Eastern Canal, and deepening the Salt Water Lake Channel, and if any land be purchased this season, suggests an arrangement be made for the continuing the Canal progressively from the Westward.

Territorial Department, Revenue Consultation No. 35. 29th December 1826.

No. 56. Letter from Secretary to Canal Committee, dated 2nd December 1826, to the Acting Secretary to Government, in reply to his letter of the 23rd November 1826, transmits the Paper marked No. 56. a.

Ibid. No. 56. a. Statement of the quantity and value of further ground required for the Circular Canal.

Ibid. No. 56. b. Report by Lieutenant T. Prinsep, dated 20th November 1826, on the state of the Entally and Balliaghaut Canal.

Ibid. No. 56. b.⁽¹⁾ Estimate of the expense necessary to deepen the Balliaghaut Canal, and reslope the Banks.

Ibid. No. 57. Letter from Lieutenant T. Prinsep, dated 16th December 1826, to Canal Committee, transmitting the Paper marked No. 57 a.

Ibid. No. 57. a. Estimate of the probable expense that will be incurred by the general working operations during the season of 1826-27

Ibid. No. 58. Letter from Secretary to Canal Committee, dated 20th December 1826, to Secretary to Government, transmitting the Paper marked No. 52, No. 57, and No. 57. a.

No. 37. 29th December 1826.

No. 59. Letter from Secretary to Government, dated 29th December 1826, to Canal Committee, requesting them, before making any bargain for land for widening the Entally Canal, that they will ascertain by a reference to the Office of the Board of Revenue, or that of the Collector of 24-Purgunnahs, how much land was purchased on that occasion, and whether the space requisite to widen the Canal is not now the property of Government.

Ibid. No. 60. Letter from H. Wood, Esq. Accountant General, dated 31st December 1826, to Acting Secretary to Government, relative to deepening the Entally Canal, and bunding the Channel through the Salt Water Lake.

Canal Committee's Proceedings, Vol. 8, page

No. 61. Letter from the Canal Committee, dated 10th January 1827, to the Secretary to the Board of Revenue, requesting to be furnished with a Statement of the quantity of ground originally purchased by Government for the Entally and Balliaghaut Canal and Roadway. See Papers marked No. 63, and 63. a.

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No. 62. Letter from Secretary to Canal Committee, dated 15th January 1827, to Acting Secretary to Government, stating the modes of payment which would be acceptable to the Proprietors of the land required for Circular Canal.	Territorial Department, Revenue Consultation No. 15. 18th January 1827.
No. 63. Letter from Secretary to the Revenue Board, dated 19th January 1827, to Secretary to Canal Committee, transmitting the Paper marked No. 63. a.	Canal Committee's Proceedings, Vol. 8. page
No. 63. a. Memoranda, shewing the quantity of ground originally purchased in 1807, for the Balliaghaut Eastern Canal.	Ibid
No. 64. Letter from Lieutenant T. Prinsep, dated 20th January 1827, to Secretary to Canal Committee, stating that he has made a Survey of the most judicious course to be given to the Chultabariah Canal which he has staked out, and requesting that the Collector of the 24-Purgunnahs be requested to depute an Aumeen to Officially purchase the ground.	Territorial Department, Revenue Consultation No. 20. 8th February, 1827.
No. 65. Letter from Secretary to Government, dated 25th January 1827, in reply to Secretary of Canal Committee's Letter marked No. 62, to Secretary to Canal Committee, states that His Lordship in Council authorizes the purchase of Land for the Circular Canal on the terms proposed.	No. 16. 25 January 1827.
No. 66. Letter from Secretary to Canal Committee, dated 29th January 1827, to W. Dampier, Esq. Commissioner of the Soondurbuns, transmitting an Extract of the Paper marked No. 64, and requesting him to depute a proper person to measure the ground which the Superintendent of Canals has marked off, preparatory to excavation, between the Tardah, Bedyadhurrie, and the Bringur Nullah near Chultabariah.	Canal Committee's Proceedings, Vol. 8. page
No. 67. Letter from the Canal Committee, dated 29th January 1827, to the Acting Secretary to Government, transmitting the Paper marked No. 61.	Territorial Department, Revenue Consultation, No. 20, 8th February, 1827.
No. 68. Letter from the Secretary to the Canal Committee, dated 29th January 1827, to the Acting Secretary to Government, transmitting for the information of Government, the Papers marked No. 61. to No. 63. a. inclusive.	Canal Committee's Proceedings, Vol. 8. page
No. 69. Letter from the Canal Committee, dated 8th February 1827, to the Acting Secretary to Government, relative to the Plan suggested by Lieutenant Prinsep for widening the Entallee and Balliaghaut Canal, Vide No. 56. b.	Ibid.
No. 70. Letter from Acting Secretary to Government, dated 8th February 1827, in reply to Canal Committee's letter of the 29th Janu-	Ibid.

ary, 1827, marked No. 69. states that His Lordship in Council approves of the Plan proposed by the Superintendent of Canals to execute the Chultabariah Canal.

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No. 71. Letter from Secretary to Canal Committee, dated 13th February 1827, to Acting Secretary to Government, stating, in reply to his letter of the 25th Ultimo, that a sum of two lacs of Rupees will, in the opinion of the Committee, be sufficient for the present to carry on the purchases of land.

Ibid

No. 72. Letter from Lieutenant T. Prinsep, dated 19th March 1827, to Secretary to Canal Committee, transmitting the Papers marked No. 72. a. and No. 72. b. and stating that he has prepared an accurate Survey of the Eastern Canal, shewing the boundaries of the several properties adjoining, and that he is able to state with certainty where encroachments have been made on the ground purchased in 1807-8, and remarking generally on the state of the Eastern Canal.

Ibid.

No. 72. a. List of encroachments that appear from the present breadth to have been made upon the Hon'ble. Company's land along the Banks of the Balliaghat and Entally Canals

Ibid

No. 72. b.* Account of the quantity of ground required to be purchased to complete the breadth of the Road on the South Bank of the Canal to 24 feet

Ibid

No. 73 Letter from Superintendent of Canals, (Lieutenant T. Prinsep), dated 4th April 1827, to Secretary to Canal Committee, respecting the Oaltadanga Canal.

Ibid.

No. 74. Letter from Secretary to Canal Committee, dated 7th May 1827, to Superintendent of Canals, in reply to his letter of the 4th April 1827, marked No. 73.

Ibid.

No. 75. Letter from Secretary to Canal Committee, dated 11th May 1827, to the Accountant General, transmitting the Papers marked No. 75. a. and objecting to certain charges in the A. C. transmitted in his letter of the 7th Ultimo.

Ibid.

No. 75. a Statement of Charges in Mr. Wood's A. C. dated 7th April 1827, relative to the Eastern Canal, which are deemed inadmissible.

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Proceedings, Vol 9.
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No. 76. Letter from Accountant General, dated 4th June 1827, to Secretary to Canal Committee, transmitting an amended A. C. of the Canal charges.

Ibid.

No. 76. a. Extract—Proceedings of the Hon'ble. the Vice-President in

Council in the Military Department, under date the 5th May 1818.

- No. 77. Letter from Lieutenant T. Prinsep, dated 9th June 1827, to Secretary to Canal Committee, bringing to his notice several circumstances to the detriment of Navigation of the Lake Channel, also some abuses which appear greatly to need the interference of the Police or executive power, as guardians of the thoroughfares.

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- No. 78. Letter from Secretary to Canal Committee, dated 18th June 1827, to the Magistrate of the 24-Pergunnahs, transmitting the Paper marked No. 77.

Ibid.

- No. 79. Letter from the Magistrate of the 24-Pergunnahs, dated 25th August 1827, to the Secretary to the Canal Committee, stating that on receipt of his letter of the 18th June instant, he had adopted measures for clearing the Salt Water Lake Channel of the obstructions complained of by the Superintendent of Canals.

Territorial De-
partment Revenue
Consultation, No.
52. 30th August
1827.

- No. 80. Letter from Secretary to Canal Committee, dated 28th August 1827, to Secretary to Government, transmitting the Paper marked No. 79.

- No. 81. Letter from Superintendent of Canals, dated 28th August 1827, to Secretary to Canal Committee, detailing the progress made in the construction of the several branches of works commenced by him since his appointment as Superintendent of Canals, as noticed in the Paper transmitted, marked No. 81. a. to No. 81. f.(1)

Ibid. No. 24. 27th
September 1827.

- No. 81. a. Report on Balliaghaut or Eastern Canal.

Ibid.

- No. 81. b. Report on Dredging Machinery and operations in the Channel of the Salt Water Lake.

Ibid.

- No. 81. c. Report on Chultabariah Canal.

Ibid.

- No. 81. d. Report on Ballygunge Canal and Dam across the Kullooar Khall.

Ibid.

- No. 81. e. Report on clearing and bunding the Bhowaneeport Canal. ..

Ibid.

- No. 81. f. Proposed scheme for the operations of the approaching year 1827-28.

Ibid.

- No. 81. f.(1) Estimate to accompany ditto.

Ibid.

- No. 82. Letter from Secretary to Government, dated 30th August 1827,

Territorial Department, Revenue Consultation, No. 53. 30th August 1827

to Secretary to Canal Committee, stating that the bill submitted by the Magistrate of 24-Pergunnahs for the purchase of a Country boat for removing obstructions in the Lake channel is passed, and sanction given to the Magistrate to entertain an establishment for the above boat.

Canal Committee's Proceedings, Vol. 9. page

No. 83. Letter from Captain T. Prinsep, dated 31st August 1827, to Secretary to Canal Committee, stating that the water of the Salt Water Lake has the effect of turning the Iron fastenings of the tin-bottomed Dredging Boats, into a kind of paste. ..

Territorial Department, Revenue Consultation, No. 23. 27th September 1827.

No. 84. Letter from Secretary to Canal Committee, dated 10th September 1827, to Secretary to Government, transmitting with the Canal Committee's suggestion, the Papers marked No. 81. and No. 81. a. to No. 81. f.(1)

Canal Committee's Proceedings, Vol. 3. page

No. 85. Letter from Secretary to Canal Committee, dated 14th September 1827, to Superintendent of Canals, requesting to be furnished with a full and particular Report on the present state of Tolly's Nullah.

Ibid. No. 25

No. 86. Letter from the Acting Secretary to Government, dated 27th September 1827, to Secretary to Canal Committee, in reply to his letter of the 10th instant, in which was conveyed the detailed Report, &c. submitted by the Superintendent of Canals, whose ingenious application of the principle of producing a current to deepen the channel of the Canal, when its bed reaches oozing sand, meets His Lordship's approval.

Territorial Department, Revenue Consultation, No. 33. 15th October 1827.

No. 87. Letter from Superintendent of Canals, dated 8th October 1827, to Secretary to Canal Committee, transmitting the Papers marked No. 87. a. and reporting upon the means of keeping open the Navigation of Tolly's Nullah throughout the year, and recommending the use of Shutter Dams, and stating that the use of Dredging Machinery in Tolly's Nullah would be expensive and inefficient.

Ibid.

No. 87. a. Memoranda on the construction of a Shutter Dam.

Ibid.

No. 88. Letter dated 15th October 1827, from Secretary to Canal Committee to Acting Secretary to Government, transmitting the Papers marked No. 87. and 87. a.

Ibid. No. 32. 6th December, 1827.

No. 89. Letter from Superintendent of Canals, (Captain T. Prinsep, Engineers,) dated 31st October 1827, transmitting the Papers marked No. 89 a. to No. 89. f. inclusive.

Ibid.

No. 89. a. A Memoir by the Superintendent of Canals on the subject

of the proposed Canal of communications, between Hooghly at Chitpore and the Balliaghaut Canal, and suggesting certain alterations in modification of the plan of that work as prepared by the late Major Schalch.

No. 89. <i>b.</i> Plan of manœuvering the Gates referred to in the above Memoir.	Territorial Department, Revenue Consultation, No. 32, 6th December, 1829.
No. 89. <i>c.</i> Estimate of the probable expense that will attend the construction of Tide Gates and Bridges referred to in the Memoir.	Ibid.
No. 89. <i>d.</i> General Estimate of the probable expense attending the construction of the Circular Canal, agreeably to the scheme proposed by Major Schalch in his Memoir and Appendix.	Ibid.
No. 89. <i>e.</i> General Estimate attending the construction of the Circular Canal, agreeably to the scheme proposed by the Superintendent of Canals, (Captain T. Prinsep of Engineers.)	Ibid.
No. 89. <i>f.</i> Chart of Tides in the River and Lake.	Ibid.
No. 90. Letter from Secretary to Canal Committee, dated 19th November 1827, to the Acting Secretary to Government, transmitting the Paper marked No. 89, and No. 89. <i>a.</i> to No. 89. <i>f.</i> inclusive.	Ibid.
No. 91. Letter from Superintendent of Canals, dated 26th November 1827, to Secretary to Canal Committee, stating that the part of Bahminghatta Canal, which traverses the cultivated country, has been staked out, and requesting that the ground may be measured by Aumeens.	Canal Committee's Proceedings, Vol. 10. page
No. 92. Letter from Secretary to Canal Committee, dated 28th November 1827, to Acting Secretary to Government, transmitting copy of the Paper marked No. 91. and requesting that the necessary communication may be made to the Soonderbunds Commissioner, to take the requisite measures for measuring the ground referred to at Bahminghatta.	Ibid.
No. 93. Letter from Acting Secretary to Government, dated 6th December 1827, to Secretary to Canal Committee, directing that other competent Engineer Officers and other persons be consulted on the subject of the Superintendent's of Canals Memoir. See Paper marked No. 89. to No. 90. inclusive.	Territorial Department, Revenue Consultation, No. 33, 6th December 1827.
No. 94. Letter from Secretary to Government, dated 18th December 1827, to Secretary to Canal Committee, transmitting the Paper marked No. 94. <i>a.</i>	Canal Committee's Proceedings, Vol. 10. page
No. 94. <i>a.</i> Extract Para. 87 to 91 of a Despatch, dated 11th July 1827,	Ibid.

from the Honorable Court of Directors, *directing that the Canal to Channel Creek may be commenced upon.*

Territorial Department Revenue Consultation No. 13. 6th January 1829.

No. 95. Letter from Captain John Colvin, Superintendent of Canals, Delhi Territory, dated 1st March 1828, transmitting the Paper marked No. 95. *a.*

No. 95. *a.* Answers by Captain John Colvin to the Queries transmitted to him by the Secretary to the Canal Committee on the subject of the Superintendent of Canals's Memoir, marked No. 89. *a.*

No. 96. Letter from Superintendent of Canals, dated 3rd May 1828, to Secretary to Canal Committee, stating that he has been compelled to abandon operations at the Kulloar Dam for this season from a variety of causes ; and requesting orders relative to opening the Hosseennabad Canal ; and adverting to a communication held with Zemindars interested on the subject of the Dam, on which the expense already incurred has been about Rs. 12,000 ; and stating that a second attempt will cost about Rs. 15,000, and requesting the orders of Government on the subject.

Ibid, No. 5. 29th May 1828.

No. 97. Letter from Secretary to Canal Committee, dated 8th May 1828, to Superintendent of Canals, stating that the Committee will postpone submitting his letter of the 3rd instant to the Government, until the final determination of the Zemindars regarding the extent of the aid they would afford in the event of a second attempt being made, to complete the Kulloar Dam.

No. 98. Letter from Superintendent of Canals, dated 19th May 1828, to Secretary to Canal Committee, stating that the Zemindars have come to no decision as yet relative to the Kulloar Dam, and that their object appears to prevent the opening of the Hosseennabad Canal, and recommending the subject to be brought to the notice of Government.

No. 99. Letter from Superintendent of Canals, dated 22nd May 1828, to Secretary to Government, transmitting the Papers marked No. 96. to No. 98. inclusive.

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No. 100. Letter from the Superintendent of Canals, dated 30th May 1828, to Secretary to Canal Committee, transmitting the Paper marked No. 100. *a.*

No. 100. *a.* Petition dated from the Zemindars of Myhuttee and Augurpara, on the danger of opening the Hosseennabad Canal into the adjoining districts.

- No. 101. Letter from Secretary to Government, dated 29th May 1828, to Secretary to Canal Committee, stating that the operations for closing Kulloar Dams are not to be renewed at the expense of Government, and if the Zemindars make no specific proposition, the mouth of the Nullah to be excavated.
Territorial Department, Revenue Consultation No. 6. 29th May 1828.
- No. 102. Letter from the Superintendent of Canals, dated 22nd August 1828, to Secretary to Canal Committee, transmitting the Papers marked No. 102. a. to No. 102. c. detailing his operations on the Eastern lines of Canals during the season of 1827-28, and other works connected therewith.
Canal Committee's Proceedings, Vol. 11. page
- No. 102. a. Report of Dredging Machinery and operations in the Channel of the Salt Water Lake.
- No. 102. b. Report on the Bhowanepore Canal.
Canal Committee's Proceedings, Vol. 11. page
- No. 102. c. Report on the Kulloar Dam and works connected with the Canal at Hossennabad.
Ibid.
- No. 103. Letter from Secretary to Canal Committee, dated 8th September 1828, to the Secretary to Government, transmitting the Superintendent's of Canals Report, dated 22nd August 1828, marked No. 102. a. to 102. c. inclusive.
Ibid.
- No. 104. Letter from Secretary to Canal Committee, dated 19th September 1828, to Secretary to Government, stating that 170 Bigahs of more ground remain to be purchased, and requesting that an assignment to the amount of (3,00,000) Three Lacks may be made in the Committee's favor to meet the purchases.
Ibid.
- No. 105. Letter from Secretary to Government, dated 28th September 1828, to Secretary to Canal Committee, stating that the Government approves of the purchase of the ground required to complete the Circular Canal, and to effect which an assignment of Three Lacks will be granted on the Sub-Treasurer...
Ibid.
- No. 106. Letter from Secretary to Government, dated 2nd October 1828, in reply to Secretary to Canal Committee's letter of the 8th September 1828, marked No. 103.
Ibid, Vol. 12. page.
- No. 107. Answers by Captain W. N. Forbes, Engineers, dated 24th October 1828, to the above Queries, submitted to him on the subject of the Superintendent's of Canals Memoir, marked No. 89. a.
Territorial Department, Revenue Consultation No. 14. 6th January 1829.
- No. 108. Ditto by Captain W. R. Fitzgerald, Engineers, dated to the above Queries.
Ibid, No 15.

Ibid, No. 16.	No. 109. Ditto by J. Kyd, Esq., dated	to the above Queries.
Ibid, No. 12.	No. 110. Ditto by Major Joseph Taylor, dated 27th October 1828, to Ditto.	
Ibid, No. 11.	No. 111. Letter from Secretary to Canal Committee, dated 3rd November 1828, to Secretary to Government, transmitting the Queries put to several Engineer Officers and others, with their Answers thereto marked No. 95. a. and 107. to 110. inclusive, on the subject of the Superintendent of Canals' Memoir, marked No. 89. a.	.. .. .
Ibid, No. 17.	No. 112. Letter from Secretary to Government, dated 6th January 1829, to Secretary to Canal Committee, stating that His Lordship in Council approves generally of the Plan proposed by the Superintendent of Canals in his Memoir, and desires that Officer may be directed to take the necessary measures for carrying it into effect.	.. .. .
	No. 113. Letter from Superintendent of Canals, dated 26th March 1829, to Secretary to Canal Committee, recommending the substitution of Draw Bridges for Suspension Bridges over the New Circular Canal.	.. .. .
	No. 114. Letter from Secretary to Canal Committee, dated 3rd April 1829, to Superintendent of Canals, bringing to his notice certain objections to his proposition of the substitution of Draw Bridges for those of Suspension, and requesting of him to state the difference, if any, in the cost of the two kinds of Bridges.	
Ibid, No. 1. 14th April 1827.		
Ibid, No. 12.		
	No. 115. Letter from Superintendent of Canals, dated 4th April 1829, to Secretary to Canal Committee, meeting the objections against Draw Bridges in place of those of Suspension.	.. ..
	No. 116. Letter from Secretary to Canal Committee, dated 9th April 1829, to Officiating Secretary to Government, transmitting the Papers marked No. 113. to No. 115. inclusive.	.. ..
Territorial Department, Revenue Consultation No. 2. 14th April 1829.	No. 117. Letter from Secretary to Government, dated 14th April 1829, to Secretary to Canal Committee, directing that the original proposition of Suspension Bridges for the Circular Canal be adhered to.	.. .. .
Ibid, No. 1. 10th November 1829.	No. 118. Annual Report, dated 19th September 1829, from the Superintendent of Canals, relative to his proceedings during the past season.	... ..
Ibid, No. 2. ditto.	No. 118. a. General Abstract of expenses for Mofussil works, for the season 1828-29, up to 1st July 1829.	.. .. .

- No. 118. *b.* General Abstract of expenses for Circular Canal, for the season 1828-29, up to 1st August 1829.
Ibid, No. 2. 10th November 1829.
- No. 118. *c.* Account of balance left Outstanding on the different works in the Canal Department, from the year 1826 to 1829.
No. 3. ditto.
No. 4. ditto.
- No. 119. Letter from Secretary to Canal Committee, dated 14th October 1829, to Superintendent of Canals, requesting to be furnished with separate minute Estimates of the description of Bridges alluded to in his last Report.
Canal Committee's Proceedings, Vol. 14. page
- No. 120. Letter from Superintendent of Canals, dated 15th October 1829, to Secretary to Canal Committee, replying to his letter of the 14th instant, marked No. 119.
Ibid.
- No. 121. Letter from Secretary to Canal Committee, dated 16th October 1829, to Superintendent of Canals, requesting to be furnished with a Statement of the method and expense of constructing the Embankments through the Salt Water Lake, proposed by him in the 11th Para. of his last Report.
Ibid.
- No. 122. Letter from Secretary to Canal Committee, dated 26th October 1829, to Secretary to Government, transmitting the Paper marked No. 122. *a.*
Territorial Department, Revenue Consultation, No. 1. 10th November 1829.
- No. 122. *a.* Extract of a letter, dated 26th August 1829, from the Superintendent of Canals, to Secretary to Canal Committee, requesting permission to make a slight alteration in the line of the proposed New Canal, and stating that it will not be attended with any expense.
Ibid.
- No. 123. Letter from Acting Secretary to Canal Committee, dated 31st October 1829, to Deputy Secretary to Government, transmitting the Papers marked No. 118. and No. 118. *a.* to No. 118. *c.* inclusive.
Ibid, No. 1. 3rd November 1829.
- No. 124. Letter from Deputy Secretary to Government, dated 10th November 1829, to Secretary to Canal Committee, in reply to his letter of the 31st October 1829, and its enclosures, marked No. 118. No. 118. *a.* to No. 118. *c.* expresses satisfaction at the progress made by the Superintendent of Canals in the past season 1828-29, and sanctions the disbursements proposed for the prosecution of works in the ensuing season.
Ibid, No. 5. 10th November 1829.
- No. 125. Letter from the Members of Canal Committee, dated 26th January 1830, to Secretary to Government, stating that in consequence of the death of the Superintendent of Canals, (Captain T. Prinsep,) they have requested Captain Fitzgerald to assume charge temporarily, of the office work of the late Superintendent.
Canal Committee's Proceedings, Vol. 14. page

tendent until the decision of Government, nominating the individual selected to supply the vacancy, shall have been communicated to them.

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No. 126. Letter from Captain W. R. Fitzgerald, in charge of the Office of Superintendent of Canals, dated 8th February 1830, to Secretary to Canal Committee, transmitting an account relative to the works entrusted to the late Superintendent of Canals for the month of November 1829, and stating that the progress of the several works under his charge, owing to the satisfactory arrangements made by the late Superintendent, has not been impeded by the death of the Superintendent. ..

Ibid, Vol. 14 page

No. 127. Letter from Secretary to Government, dated 23rd February 1830, to Members of the Canal Committee, stating that the Governor General has been pleased to assign to Mr. James Prinsep the duty of completing the Circular Canal, and that he has been directed to place himself in communication with the Committee.

Ibid, Vol. 15.
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No. 128. Letter from Superintendent of Canals, dated 15th September 1830, to Secretary to Canal Committee, transmitting the Papers marked No. 128. a. to No. 128. a.(5) inclusive. ..

No. 128. a. Report on Canal operations during the year 1829-30. ..

No. 128. a.(1) General Abstract of expenses for Mofussil works for the season of 1829-30, from July to 30th June 1830.

No. 128. a.(2) Ditto of Circular Canal for ditto from 1st August 1829, to 30th June 1830.

No. 128. a.(3) List of Outstanding Balances to 30th June 1830. ..

No. 128. a.(4) Comparison of the depth of water in the Eastern Canal on the 26th December 1827, and after dredging on the 9th September 1830.

No. 128. a.(5) Statement of the Boats passing through the Bahminghatta Canal.

Ibid, Vol. 15.
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No. 129. Letter from Secretary to Canal Committee, dated 4th November 1830, to Superintendent of Canals, requesting him to state his opinion on the Question of reconstructing the Kullooar Dam, and to furnish an estimate of the probable cost of doing so. ..

Ibid.

No. 130. Letter from Superintendent of Canals, dated 3rd December 1830, to Secretary to Canal Committee, relative to the expediency of reconstructing the Kullooar Dam.

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No. 131. Letter from Superintendent of Canals, dated 3rd December 1830, to Secretary to Canal Committee, transmitting a Supplement to the scheme of works for the season 1830-31, in continuation of his Annual Report, dated 15th September 1830.		Canal Committee's Proceedings Vol. 15. page
No. 132. Letter from Secretary to Canal Committee, dated 20th December 1830, to the Sub-Treasurer, stating that the Records of the Canal Committee's Office have this day been made over to the Secretary to the Military Board, agreeably to the Orders of the Right Hon'ble the Governor General, as promulgated in the Government Gazette of the 16th instant. ..		Ibid.

NOTE.—For a Continuation of the above Papers, See Papers selected from the Military Board's Proceedings the Canal Department.—J. M.

Papers pertaining to the Index of Appendix (H) subsequently obtained.—J. M.

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No. 24½. Letter from Secretary to Government, dated 20th February 1824, No. 128, to the Canal Committee, in reply to their letter of the 21st January 1824, appoints Captain Baker as Assistant to Captain Schaleh, in the Suspension Bridge Department,	
No. 29½. Letter from Captain Baker, dated the 18th November 1824, to Canal Committee, stating, that agreeably with instructions received from Major Schaleh, he had taken charge of the Iron Bridge Department from the 1st instant,	
No. 32½. Letter from Secretary to Government, dated 28th April 1825, to Canal Committee, in reply to their letters of the 16th and 21st of March last, states, that no Military Officer having been available, and since no uncovenanted person qualified to undertake the Superintendence of the Eastern Canal works can be met with, all thoughts of active operations this season must be relinquished; that Captain Taylor's health does not admit of his being employed in the execution of the above work, accordingly his services have been transferred to the Department under the late Major Schaleh,	
No. 51. a. Estimate of expense required to construct a Dredging Machine to rest upon two Native Boats, strongly bound together,	200
No. 53½. Letter from Secretary to Canal Committee, dated 14th November 1826, to H. T. Prinsep, Esq., Acting Secretary to Government, transmitting the Paper marked No. 51 a., and recommending the outlay therein referred to be sanctioned,	
No. 56½. Letter from Secretary to Canal Committee, dated 5th December 1826, to Superintendent of Canals, in reply to his Letter of the 20th ultimo, states, that his Letter marked No 56 b., and its enclosure, have been transmitted to Government for its consideration and orders,	144
No. 71½. Letter from Secretary to Canal Committee, dated 19th February 1827, to Superintendent of Canals, transmitting copy of the Paper marked Nos. 63 and 63 a., and stating, that His Lordship had been pleased to sanction the execution of the work in the manner suggested by the Superintendent,	147

NOTE.—Those Papers of the Index to Appendix (H) which contain no reference to the pages of that Appendix, have not been deemed by the Municipal Committee necessary to be printed.—J. M.

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No. 72. c. Estimate of the expense of widening and laying a pukka Road of 24 feet breadth, from the disembogueement of the Ooltadangah Canal, Westward to the Dhurumtollah main exit, with a 2 feet Drain on the Land-side,	150
No. 72 $\frac{1}{4}$. Letter from Secretary to Canal Committee, dated 27th March 1827, to Superintendent of Canals, requesting to know whether the same want of tenacity in the soil of the Banks of the Canal exists to the whole way from the Cooleah Bridge East to Balleaghat, in which case it would be useless constructing the pukka Road,	151
No. 72 $\frac{1}{2}$. Letter from Secretary to Canal Committee, dated 11th May 1827, to Acting Secretary to Government, requesting to know how the Committee shall proceed to recover the 18 Cottahs and 12 Chittacks of Canal Land on the South Bank of the Canal,	Ibid.
No. 102. a. $\frac{1}{4}$. Report on the New Canal between Ghoonamagee and Kantatullah and thence to Bahminghatta,	96
No. 102. a. $\frac{1}{2}$. Report on the Chultabareah Canal, and works executed in connection with it,	97
No. 102. c. $\frac{1}{4}$. Eastern Canal Road, and other miscellaneous work, ..	100
No. 102. c. $\frac{1}{2}$. Scheme for Moffussil operations during 1828-29. ..	101

APPENDIX (H)

No. 2. a.

TO HOLT MACKENZIE, ESQ.

Secretary to Government.

SIR,

I have the honor to acknowledge the receipt of your letter of the 27th February last, with its enclosures, relating to the head of the Eastern, or Balliaghaut Canal.

In reply I beg leave to observe, that the part of the Canal alluded to, has been for a length of time in an unnavigable condition, from the cause assigned by Mr. Trower; viz. the quantity of mud and filth poured into it from the town.

The obstruction extends from the head of the Canal to the Bridge at Cooleah, a distance of 5,250 feet, in which extent the average depth of water does not exceed one foot. The breadth averages 60 feet.

It appears to me, that the cause of this obstruction would be in a great measure removed, if the Canal were under the influence of the Tides from the Sunderbunds; a considerable quantity of the filth of the Town, which is now deposited, from the stagnant state of the Canal, would then be carried out by the Ebb into the deep Sunderbund Passages, to the Eastward of the Salt Lake. Another advantage that would result from the entrance of the Tide into the Canal would be, an accumulation of water at high water, which would allow boats of a greater burden to navigate it, than can do so at present. The probable rise would be three feet.

From a Survey I made of the Salt Lake, I found that, at a distance into the Lake of 7,800 feet from the Eastern extremity of the Canal, the bed of the Lake is dry at low water; and is only partially covered by the Tide during the Flood, and that a deep and broad Nullah there commences, which forms a passage for the Tide from the Sunderbunds to the low parts of the Lake, near the mouth of the Canal.

In order therefore to conduct the Tide into the Canal, nothing further would be required than to prevent its spreading over the surface of the Lake. This could be effected by raising bunds along the sides of the above-mentioned Nullah, from Bamingutta on the Eastern side of the Lake, to the spot in the Lake before mentioned, and continuing them to the mouth of the Canal at Balliaghaut.

The expense of this operation will not be considerable, and will be more than compensated by the tolls on the additional number of boats which would then enter the Canal, instead of depositing their cargoes, as is done at present, outside the Canal at Balliaghaut.

The adoption of this plan will likewise be favorable to that of the great Eastern Canal, lately authorized by Government to be carried into execution, of which indeed it forms a part.

The expense of deepening the Canal, from its head to the Bridge at Cooleah, and of the Bunds from Bomingotta to the mouth of the Canal, will probably be as follows :—

Length from the Bridge to the head of the Canal, ...	3,250 feet.
Breadth,	60 feet.
Depth,	5 feet.
Total cubic contents,	9,75,000

The depth of the excavation being between 18 and 25 feet below the surface of the ground, the cost per 100 cubic feet, according to the established rates in Calcutta, would amount to two annas ten pic. In the present instance, however, a considerable allowance must be made for freeing the part to be excavated from water, and for the distance it will be necessary to carry the earth from the bank. The above rate will therefore probably be doubled, or 5 annas 8 pic per 100 cubic feet. Excavating 9,75,000 cubic feet at this rate, will amount to Sicca Rupees, 3,454 0 0

Bunding in the Channel on both sides through the Lake by mounds 4 feet high, and averaging 8 feet broad ; a distance of 6 miles, at 10 Rs. per hundred running feet,	Sicca Rs. 6,331 0 0
Total,	Sicca Rs. 9,785 0 0

In reply to the 2nd Paragraph of your letter, I beg leave to say, that I could undertake to clear the Canal in question, without interruption to my other duties.

I trust I shall be excused the liberty I take in calling the attention of Government to the Cooleah Bridge, above mentioned, which is at present in so ruinous a condition, as to threaten destruction to boats passing under it. From the sinking of the piers, the Bridge has fallen about 4 inches at the haunches ; many of the arch bricks have been displaced, and others are daily giving away. The immediate removal of this Bridge appears to be a measure of indispensable necessity, not only to insure the safety of those navigating the Canal, but to render the improvement of the head of the Canal useful to its fullest extent. At present, boats exceeding 100 maunds burden cannot frequent the head of the Canal, owing to the contracted span of the Cooleah Bridge.

I have the honor to be,

Sir,

Your obedient servant,

J. AUGUSTUS SCHALCH,

Deputy Assistant Quarter Master General.

CALCUTTA,
5th April 1823.

No. 5.

To CAPTAIN JACKSON,

Assistant Quarter Master General, and Secretary to the Canal Committee.

SIR,

I have the honor to Report to*the Canal Committee, for the information of Government, that I have completed a minute examination* of Tolly's Nullah ; have taken numerous Sections of it, and obtained the most accurate information on every point connected with its present unnavigable condition.

* Search has been made among the Original Proceedings of the late Canal Committee for this Paper, but with no success. If it were known where the late Major Schallch's private Documents, which it is believed were purchased by the Government, are lodged, possibly among them the above paper would be found. — J. M.

I was about to lay a full Report on the State of the Nullah before Government, when the Order for the formation of the Channel Creek Canal was communicated to me by the Committee. In consequence of this Order, it becomes necessary to consider the former undertaking solely with reference to its probable effects on the latter. The two have therefore become so intimately blended, that they can no longer be considered in a separate light. I trust I shall in consequence meet with the sanction of Government to my refraining at present from any distinct report on Tolly's Nullah. The Plans and Sections I have made of the Nullah, together with the information I have collected in my Survey of it, will of course be laid before the Canal Committee.

In the mean time I am preparing materials for the information required by the 9th Paragraph of the Resolution of Government under date the 23d ultimo.

I have the honor to be,

Sir,

Your obedient servant,

(Signed) J. A. SCHALCH.

(A True Copy)

JAMES JACKSON, *Captain,*

Secretary to the Canal Committee

CALCUTTA,
15th May 1823.

No. 6.

TO CAPTAIN JACKSON,

Assistant Quarter Master General and Secretary to the Canal Committee

SIR,

In reply to your letter of the 11th instant, I beg leave to offer to the Committee the following observations on the points therein referred to :—

It will not admit of a doubt that at present Tolly's Nullah is so much crowded with Boats from the Upper and Eastern parts of the Country, that it could not be made available to any extent as a Channel of communication between Calcutta and the proposed Saugor Canal, yet it does not appear to me, that an objection in consequence lies to the immediate commencement of that Canal. On the contrary, by carrying on the Saugor and Eastern Canals in concert, it may be expected that they will both be completed about the same period, and consequently, that Tolly's Nullah will then be left free for the Saugor Navigation.

An objection may be urged to prosecuting both operations at the same time, that a number of hands will be employed on the Saugor Canal that might be placed with more advantage on the other. From the inquiries, however, that I have lately made on this point, and from the populousness of the country through which the line of the former Canal runs, I am led to believe that there is a considerable portion of the inhabitants of the adjacent villages, who would willingly work as day labourers in the immediate neighbourhood of their houses, who could not be prevailed on to accept employment at a distance. It would of course be advisable to confine the operations of the Saugor Canal as much as possible to this class.

With regard to that part of the 9th Paragraph of the Resolution of Government, relating to the construction of Bridges over Tolly's Nullah, from which I infer, that it is the intention of Government to substitute, in lieu of the present ones, others better adapted to the

free navigation of the Nullah, I beg leave to observe, that the removal of the present wooden Bridges is a measure indispensable to the unobstructed navigation of the Nullah. Not only do their confined arches impede the general velocity of the stream, and consequently accelerate the deposition of mud and sand, but so great a rush of water takes place immediately under the Bridges as to render the passage through at all times difficult and dangerous, and sometimes impracticable. During the time I was employed in the Survey of the Sunderbunds I had frequent occasion to pass under those Bridges, I do not recollect ever having done so without some accident occurring either to the boats or crews. Independent of the difficulty and danger of passing under the Bridges, an idea may be formed of the delay which they occasion, from the fact, that the Kidderpoor and Allepoor Bridges can only be passed at high water, owing to the quantity of bricks and other hard substances which it has been found necessary to throw in to preserve the bed, whilst the Tolly Gunge Bridge, from being so low, can only be passed at the lowest state of the Tide. The consequence of which is, that the accumulation of boats in the immediate vicinity of the latter Bridge is at times so great, that the Nullah becomes obstructed to a degree to preclude entirely a passage through.

I would therefore earnestly recommend to the Committee to adopt measures for the immediate removal of these Bridges, and to substitute in lieu of them, others on the Suspension principle, which will effectually remedy the evils above enumerated.

The Kidderpoor Bridge is now in so dilapidated, and even so dangerous a condition, that its removal would be advisable on these grounds alone.

The Tolly Gunge Bridge is also in a bad state of repair, and is besides of dimensions inadequate to the number of men and carriages which now pass over it. I would therefore suggest to the Committee, that the removal of these Bridges be first taken into consideration.

I am now preparing, and have nearly completed, plans of the sides of the Bridges, together with plans of the proposed improvement, which I shall do myself the honor of laying before the Committee at an early period. I shall only observe on this head, that new Bridges on the above principle can be constructed without interfering materially with the present passage. Understanding that it is the intention of Government to erect a Bridge near the mouth of the Nullah, to form a shorter communication with Garden Reach, than that through the Kidderpoor Bazar, I take the liberty of offering the remark, that if this Bridge was in the first place erected, it would considerably relieve that at Kidderpoor, and give greater freedom to the future operations in the latter quarter.

On the subject of clearing Tolly's Nullah, which forms the remaining part of the 9th Paragraph of the Resolution above quoted, it appears to me that it can only be successfully effected by the operation of dredging, an operation which with local reference to the lower part of Bengal, offers, on a speculative examination, so many advantages over the present practice of Canal digging, that I cannot refrain from requesting the earnest attention of the Committee to the subject.

Impressed with an idea of the advantages to be derived from this mode of excavation in Bengal, I brought them to the notice of Government in August last, at the same time requesting to be allowed to purchase a Steam Engine, and adapt a Dredging apparatus and boat to it. Government was pleased to sanction my request, but owing to the delay that has taken place in fitting up the engine, I have not yet practically ascertained its power. The expense of Steam Dredging Machines will of course preclude their general employment in works of a temporary nature, like those under the control of the Committee, but that a considerable saving in manual labour in excavating the proposed Canals will result from the employment of these Machines, even if worked by men, is evident, on considering that in Tank or Canal digging, the number of hands employed on actual digging and filling the baskets, according to the present mode, bears but a small proportion to those engaged in removing the earth in the Dredging boats; only the first class of labourers will be necessary

the excavated earth being removed in a boat so constructed, that the earth may be dropped through the bottom in a deep part of the Channel. This operation will therefore be admirably adapted to the intended excavations, which are for the most part situated in the vicinity of deep rivers.

Dredging Machines might be employed with peculiar advantage in the Salt Water Lake, the Koosrie Khaul, and the Deacol Canal, which passes through an extensive morass, and in widening and deepening the Bytagatta Canal.

They could also be employed generally on all the Canals after a certain progress has been effected by the usual mode, and by a slight variation in their construction, might even be made to excavate a Canal from the beginning, where it is not required to be of any great length. Of this description, are the Cheltabaria, Narolee, and Nusserpoor Canals. Mr. May, the Supervisor of Nuddea Rivers, has lately made a trial with a Dredging Machine worked by hand, which he informed me answered his fullest expectation. As to the quantity of earth it lifted in a given time, owing however to his anxiety to put the machine at work on the Matabangah River, no exact calculation of the expense of its operations could at all times be ascertained.

The importance of reducing manual labour to the lowest scale, in the extensive works now under the superintendence of the Committee, will fully warrant a trial of the power of Dredging Machines on the above principle; and I earnestly hope the Committee will take advantage of the season of inactivity, to put them to the test. The expense of constructing the boat and apparatus, supposing the boat to be built of good Saul timber, which is sufficiently durable for the purpose, and coppered, will not probably exceed 4,000 Rs., and if begun immediately, might be completed during the rainy season.

I have the honor to be, &c.

(Signed) J. A. SCHALCH, *Superintendent of Canals
and Agent for the preparation of Suspension Bridges.*

CALCUTTA,
19th May, 1823.

No. 9.

No. 17.

To H. MACKENZIE, ESQ.

Secretary to Government, Territorial Department.

SIR,

The preliminary arrangements for the purchase of the Lands required for the projected Canal, from the Baliaghaut Canal to the Hoogly River, above Chitpoor, having been entered into by the Committee, I have the honor, by their desire to request, you will bring to the notice of the Honorable the Governor General in Council the following Plan of Procedure proposed to be adopted by them.

2. The line of the Canal on a width of 400 feet, from the Eastern Canal to Chitpoor, has already been determined upon, on an inspection of the Survey prepared by Lieutenant Schalch, and it has been resolved, that the progress of the purchases between given points, should be regulated in Committee, after which the Native Ameen is to proceed, under the guidance of the Secretary, to make preliminary arrangements with the several Proprietors for the purchase of the ground required.

APP. H.

3. These Preliminaries being settled, the Surveyor under Lieut. Schalch, is to fill up in the general Survey, the minute divisions of the several parcels of ground, for the Purchase of which, adjustment has been made, when, the name of the Proprietor, with a number corresponding with that in the Register of Purchases is to be entered on the Plan ; a copy of the Plan of each Division in which the Sub-divisional lines of demarcation of the Lands of the several Proprietors will be inserted, to be transmitted with the Secretary's Accounts of Purchases.

4. The Committee having thus satisfied themselves as to the Extent and Nature of the Premises about to be purchased, will direct the preparation of the Deeds of Conveyance, the Payment of the Purchase money, Possession to be taken of the Property, and the Preservation of the Title Deeds acquired.

5. These the Committee consider very material points, and that it is extremely desirable that the same practice and method with regard to them, should be observed in every case.

6. With regard to the preparation of the Deeds, few cases, the Committee imagine, will occur, in which it will be deemed necessary that they should be drawn, with the formalities of English Law. The usual Bynama, executed in the Native Languages, and confirmed by the delivery of the Title Deed of the Seller, will be, in the generality of cases, all that is requisite.

7. It will be the duty of the Ameen to report to the Committee any case of doubt or difficulty ; but with regard to others, the Committee think he may be safely trusted in judging of the simple validity of Title, with reference to the Customs and Usages of the 24-Per-gunnahs, in which he was for many years Sherishtadar, in the Collector's Office.

8. Where the right to any premises about to be purchased, is contested, the publicity of the Committee's Proceedings, and the delay which will take place between the preliminary steps to the Purchase, and the actual Payment of the Purchase money, will allow ample time for the claimant to come forward and assert his claim, which will be enquired into by the Committee, who conclude, that the Legislature enactment about to be put in force, will make a provision for the adjustment of cases, where the parties may not be disposed to enter into an amicable adjustment.

9. With respect to the Payment of the Purchase money, the Committee suggest, that having obtained a Credit on the General Treasury, the Secretary should grant a Draft on the Sub-Treasurer to each Proprietor, the cost of whose lands and premises generally, shall exceed the sum of Sicca Rupees Two Thousand, (Sa. Rs. 2,000.) To Under Proprietors from whom purchases are made, to an amount below the above sum, payment shall be made by the Secretary, who will draw for the total amount required to discharge their several claims.

10. In all cases the Drafts of the Secretary, or those granted by him, shall be countersigned by two of the Members of the Committee. A Register of all Drafts to be kept by the Secretary, to be submitted to the Committee at all Meetings, when it will receive the counter-signature of the Members present, and a copy be forwarded with the Account and half yearly Reports to Government.

11. No Draft will be delivered to the Proprietors, or sums paid, until a full adjustment of the Purchase has been made.

12. This appears to the Committee the safest, and simplest plan. It will obviate the necessity of having any large sums in deposit, or the alternative of making frequent applications to Government for advances.

13. The taking possession of premises purchased, should be done in the customary form.

14. A Chowekedar to be placed on the ground, and measures immediately adopted by the Secretary for clearing it, who will render to the Committee the accounts of all expenses incurred for this purpose.

15. With respect to the Title Deeds, they should be regularly numbered, attested by the Secretary, in the presence of the Committee, tied up in a Nuttee with a Firhist, and kept in his office. Eventually it will be desirable, that they should be deposited in the Record Office of the Collector of the 24-Pergunnahs; but until the resales of the ground are concluded, it will be most convenient that they should remain in the keeping of the Secretary, as any confusion, or irregularity in the preservation of the Records of our Purchases and Sales, may be hereafter attended with considerable embarrassment to the Committee.

16. For this purpose, the Committee beg to suggest to Government the necessity for their employing a Record Keeper, on a salary of Sicca Rupees Thirty (Sa. Rs. 30) per month, and a Mohurier on Twenty Rs. (Sa. Rs. 20,) acquainted with the Bengallee and Persian Languages, for the due preservation of the Records, and for keeping up the several Registers of Sale, and Purchase—duties that we cannot expect the Ameen to fulfil satisfactorily without such assistance. When the whole of the Purchases and Resales have been effected, the Committee propose to make over all the Documents to the Collector of the 24-Pergunnahs.

17. To enable the Committee to close the purchase of such lands and premises, for which preliminary arrangements have been made, and to carry on their future purchases, they request you will obtain from Government, a credit in their favor on the General Treasury, for the sum of Sicca Rupees Two Lacs, to be drawn for in the manner already stated.

I have the honor to be,

Sir,

Your most obedient Servant,

J. N. JACKSON, *Captain,*

Secretary Canal Committee.

CALCUTTA,
10th June, 1823.

No. 10.

No 522.

To CAPTAIN J. N. JACKSON,

Territorial Department.

Secretary to the Canal Committee.

SIR,

I am directed by the Governor General in Council, to acknowledge the receipt of your letter, dated the 27th ultimo, with its enclosures.

2. The Governor General in Council remarks, that whatever is done for the improvement of the Navigation of Tolly's Nullah, must now be done with reference to the Canal to Channel Creek. No separate Report is therefore required, and the appointment of Lieut. Schalch to Survey the Nullah, under the Orders of the 8th February 1822, is to be considered as having merged in his latter appointment of Superintendent of Canals.

I am, &c.

Your most obedient Servant,

(Signed) HOLT MACKENZIE,

Secretary to Government.

COUNCIL CHAMBER,
The 12th June, 1823.

No. 19.

(Copy.)

TO CAPTAIN JACKSON,

Assistant Quarter Master General, Secretary to the Canal Committee.

SIR,

Having been engaged for some time past in making enquiries as to the rates of labour, in Tank and Canal digging, and also in clearing the Jungle at different places along the line of the proposed Canals, together with other subjects connected with their excavation, I have now the honor of sending the result of my enquiries to the Committee, and of offering a few suggestions that have arisen out of them, which will I trust, meet with the approbation and sanction of the Committee.

2. It appears that the wages given by the Zeemeendars to Tank Diggers, varies in different parts of the line, from $3/8$ to $3/12$ and 4 Rs. and that to every thousand men so employed, an allowance is demanded for Sirdars and Mates, varying in number from 4 to 7 of the former, and 5 to 10 of the latter, and in pay, from 5 to $7/8$ for the former.—The pay of the latter seems to be very generally fixed at 4 Rupees.

3. These rates were ascertained by Lieutenant Prinsep in his late visit to the Sunderbunds, and they agree with those at which the Sirdars, and other Natives, whose employment lies in furnishing Coolies, have offered to supply them.

4. As the difference in the rates of labour does not arise so much from the situation of the place as from the difference in the demands of the Sirdars, it appears to me, therefore, that it would be advisable to establish a fixed rate of hire, viz. $3/12$ for Labourers, 6 Rs. for Sirdars, and 4 for Mates, with an allowance of 6 Sirdars and 10 Mates to 1,000 Labourers. This is about the mean of the numerous rates with which I have been supplied, and which will, I am led to believe, be sufficiently high to ensure the required number of Labourers.

5. I have already received offers to clear Jungle at the above mentioned rates.

6. From what I can collect, I do not apprehend any scarcity of hands from Labourers engaging to make Salt in preference to working on the Canals, as it appears, those available for the latter employment, will be drawn from Villages lying to the North of the Salt Districts. It is doubtful as yet if it will be necessary to raise the pay of the Labourers during the harvest season, in November and December.

7. It is calculated that 2,500 men will excavate one mile of the Canal in one month. The length of Canal to be excavated between Culna and the Salt Lake is as follows, nearly:—

Nuggerpoor Canal,	$1\frac{1}{2}$ miles.
Narolee Ditto,	$\frac{1}{2}$
Sireepoor Ditto,	9
Husseinabad Ditto,	9
Cheltabaria Ditto,	$3\frac{1}{2}$
Baminghatta Ditto,	5

Total $28\frac{1}{2}$

Now supposing it practicable to commence excavating these Canals in December, (and I see nothing at present to lead to a doubt of the practicability of doing so,) there will still remain six months of the most favorable part of the year for Canal operations, to complete therefore the whole length of excavation between Culna and the Salt Lake,

it will be necessary to employ 11,884 Labourers, which will involve a monthly expenditure of Sa. Rs. 48,404, or the expense of Workmen for the season will amount to Sa. Rs. 2,90,424.

8. I do not apprehend any difficulty in procuring the above number of hands, as I have already received Tenders from Sirdars to supply a far greater number.

9. In the above Estimate, I have not included the men that will be required for the Circular Road Canal, as there is little hope of being able to commence it this Season, from the stoppage that has taken place in the purchase of land.

10. It appears, that an advance of 2 Rs. for each man is demanded by (and is usually given to) the Sirdars, fifteen or thirty days before the men are required, according to the distance from which they are to be collected. It also appears, that it will be necessary to make the required advances and payments at different places along the line. Those which at present seem to be the most suitable are Baugundee and Narolee; a Cash-keeper with his Mohurir will consequently be required at each of these places, as also a Guard of Sepoys. The sum it will be necessary to keep in hand at Baugundee and Narolee, in order to insure the prompt payment of the Labourer's wages, should not be less than the probable amount of one month's disbursement, or Sa. Rs. 50,000 in round numbers.

11. At Baugundee, a Jemadar's party would perhaps be sufficiently strong to guard the money deposited there, as it would also be assisted by the Guard of the Salt Agency, at Narolee. As the amount of cash will never exceed 12,000 Rs. a Havildar's party may be thought a sufficient guard for such a sum.

12. While on the subject of Sepoy Guards, I beg leave to remark, that a guard will be required to protect the men employed in clearing the Jungle between Husseinabad and Bussera, from Tigers, and also during the time the Labourers are at work on the Canals. A Jemadar's party, with a few Shikarees, would be sufficient. The number of men therefore that it will be necessary to apply for, will be 72 Sepoys, with the usual proportion of Native Officers and Camp Equipage.

13. As I have already engaged a number of Woodcutters to be in readiness at Husseinabad, by the 15th of November, in order that no delay may take place in marking out the direction of this Canal, I beg the Committee will make an early application to Government for the Sepoys to protect them.

14. It is of very material consequence to the success of the operations in this quarter, that few casualties should take place from Tigers, particularly at the commencement of the work, as they would undoubtedly operate, either to a total abandonment of this part of the scheme, or to increase the rates of labour to an exorbitant degree, not only on this, but on all the other Canals. Much time would probably be saved in procuring the Guard, if it were drawn from the Calcutta Native Militia, the men of which corps will not be so subject to sickness in the Sunderbund districts as Sepoys from the regular Regiments.

15. I also take the liberty of suggesting to the Committee, the propriety of taking measures to secure to Government, the right of the land cleared on each side of the Canals that now pass through Jungle, which, without some precaution of this nature, would at a future period be claimed by those Zeemeendars, whose Estates lie in the neighbourhood of the line, and who will carry their cultivation up to it as soon as the Canals shall be opened. The Zeemeendars have, I believe at present, no Proprietary right in uncleared Sunderbund Tracts; by placing a broad belt on each side of the Canals in the hands of Government, its cultivation could always be secured, which is of material consequence to the future safe navigation of them. } Sic in Original.
J. M.

16. As the European Overseers, and the parties of Labourers will be constantly moving as the work is in progress, I take the liberty of recommending, that tents be substituted in

lieu of temporary Bungalows for the European Overseers, the expense will be about the same, but the former will be far more convenient. The description of tent that would be required is that used by European Serjeants; these I could get made up by the Commissariat Agent for 185 Rs. each.

17. I also take this opportunity of stating to the Committee, that it will probably be requisite to establish Bazars, when the working parties are at a distance from the Haths and regular Bazars of the District. During the time the Jungle is clearing, it will also be necessary to engage a few Boats for the Woodcutters to sleep in.

18. I take the liberty of calling the attention of the Committee to the serious consequences that will result, in the employment of so great a number of Labourers, from delay in the payment of their wages, or from a deficiency of hands during the working season, and beg that the Committee will have at its disposal for the ensuing season, a sum not less than Sa. Rs. 3,00,000, or three Lacks, to ensure the prompt payment of such advances as it may be necessary to make from time to time.

19. Considering the amount of the contemplated expenditure, and the numerous detailed accounts that will attend it, I beg I may be allowed an Accountant, on such a salary as the Committee may think sufficiently liberal to insure the services of a man of respectability. I also request, that my Assistant, Lieut. Prinsep, may be allowed the same.

20. As the work proceeds, I shall inform the Committee of the number of Writers that may be necessary; at present, the one already allowed me is sufficient.

I have the honor to be,

Sir,

Your obedient Servant,

(Signed) J. AUG. SCHALCH,
Superintendent of Canals, &c.

CALCUTTA,

6th October, 1823.

A true Copy,

J. JACKSON, *Captain,*

Secretary to the Canal Committee.

No. 27.

To W. PATON,
H. SHAKESPEAR,
C. BARWELL, AND
CAPT. W. SWINTON, } ESQRS.

Committee for Reporting on Lt. Schalch's Plans.

Revenue, the 30th July, 1821.

GENTLEMEN,

I am directed to inform you, that the Governor General in Council has resolved that all Public Works, likely to occasion any considerable Disbursement, and which are not of indispensable necessity, or such as that the discontinuance of them would be seriously detrimental, shall for the present be suspended, and with reference to that Resolution to communicate to you as follows:—

2. The Channel Creek and Diamond Harbour Canal has not, it is understood, yet been commenced on: and His Lordship in Council has determined, therefore, that all measures towards the completion of it shall be postponed until further orders. It is not,

however, intended to delay the completion of the Suspension Bridge over Tolly's Nullah at Kidderpore, authorized by the Orders of Government of the 17th July 1823; that work appearing to be urgently required.

3. It further appears to the Governor General in Council, that the further prosecution of the Canal from Calcutta to Culna ought for the present to be suspended, though His Lordship in Council is of course fully sensible of the general inconvenience incident to any delay in the completion of so useful a work. Before, however, passing any final orders on this subject, His Lordship in Council desires to receive from you, (and you are requested to furnish it as soon as possible,) a succinct account of what has been done; whether in the purchase of Ground, the excavation of the Canal, or in any other works connected with the progress of the undertaking, with a communication of your sentiments in regard to the course most expedient to be followed under the Resolution stated at the commencement of this letter. You will of course immediately consider and report what reduction of Establishment can be made, (whether in the Canal or Suspension Bridge Department,) on the supposition, first, that the further prosecution of the Canals is entirely suspended; and, secondly, that the works are only partially discontinued, if the latter course shall appear to you most proper.

I have, &c.

Secretary to Govt.

No. 27. a

No. 868.

Extract from the Proceedings of the Right Honorable the Governor General in Council, in the Territorial Department, under date the 23rd July, 1824.

RESOLUTION.—The Governor General in Council observes, that since the sketch Estimate of the Receipts and Disbursements of the current year 1824-25 was prepared, several arrangements and measures, calculated materially to increase the public charges, have been adopted, and the state of the Cash Balances, and the various external demands, which have to be met within the year, render it essentially important, that the financial Officers of Government should be informed as early and accurately as possible of the probable extent of the charges, consequent on the War with the Burmese, which will have to be incurred within the period in question, in order that they may without delay enter on a consideration of the sufficiency of our means for the unembarrassed conduct of the Public Service, and of the arrangements to be adopted for supplying the requisite funds.

2. Resolved accordingly,—That there be prepared in the Military and Secret Departments, as accurate Estimates as practicable, of the probable amount of the War Charges which have been incurred, and are likely to be incurred, in the course of the current year.

3. The Governor General in Council is further pleased to resolve, with reference to the present state of things, that all Public Works, likely to occasion any considerable Disbursement, and which are not of indispensable necessity, or such as that the discontinuance of them would be seriously detrimental, shall for the present be suspended. The practical application of this Resolution will be further considered in the several Departments, in communication with the Boards and Committees whom it concerns.

Ordered,—That a Copy of the above Resolution be sent to the Military and Secret Department, whence immediate measures will be taken to prepare and transmit to this Department, Estimates, as specified in the 2d paragraph : from the former, of the charges incident to arrangements which have been actually authorized in the Military ; and from the latter, of those likely to result from measures and operations ordered or contemplated in the Political Department.

Ordered also,—That a Copy of the same Resolution be also sent to the Judicial Department, for the purpose specified in the 3rd paragraph. For the same purpose, a Copy of the Resolution will be transferred to the Revenue branch of the Territorial Department.

(A true Extract,)

HOLT MACKENZIE,
Secretary to the Government.

No. 28.

(Copy.)

TO LIEUTENANT GARDEN,

Officiating Secretary to the Canal Committee.

SIR,

In reply to your letter of the 6th ultimo, I now do myself the honor of forwarding to the Committee, a Statement of the present condition of the Public Works under my superintendence, taking them for the sake of perspicuity in the following order :—

1st. The Iron Bridges.

2nd. The Canals.

2. Of the Bridges, the two for the Goreekal and Kuddamkundee Nullahs on the Cuttack Road have been finished, and packed up preparatory to being shipped to their destinations. They have been temporarily fixed up in the Yard, and every part so fitted together and marked, as to render their final adjustment a matter of easy accomplishment. A report of their completion has been sent to the Military Board.

3. I request the Committee will recommend to Government, that the Bridges be forwarded without delay to Balasore, in order that the present favorable season for their erection may not be lost. The iron and wood work have been prepared at a considerable expense, and the Masonry of the piers of one of the Bridges has, I understand, been completed. By delaying to erect the Bridges, the wood work must be renewed, and a further expense incurred, in refitting the iron work, and replacing the marks of reference, which in a few months will become illegible.

4. An accurate Survey and Sections have been taken of the Currunnassa River, where it intersects the New Road from Calcutta to Benares, preparatory to forming a plan for a Bridge, which is now under consideration.

5th. A plan for a Bridge over the Sooinbah Nullah, which crosses the Road between Benares and the Cantonment of Sultanpoor, was delivered to the Military Board, with a request, that it might be forwarded to the Barrack-master at Benares for his opinion and estimate on certain points connected with the Masonry. A reply from the Military Board has not yet been received.

6th. Plans of Bridges for the Soondee and Teel Nullahs, near the station of Chuprah, are now in progress, founded upon the Sections of the Nullahs taken by my Assistant, Captain Baker, when on his way to join my department from the Upper Provinces.

7th. The Kidderpoor Bridge is in a considerable state of forwardness. The difficulty of erecting the Rivetment Walls on a foundation extremely unfavorable, has been overcome, and the Masonry has stood the effects of the rainy season, without exhibiting any appearance of weakness.

8th. The soil on which the foundation of the Rivetment Walls were to be built, was discovered on digging to consist wholly of a loose quicksand, which opposed a difficulty to their construction, at first sight insurmountable. By sinking, however, rows of piles, and connecting them by planks, the interior space was excavated, with much labour, to the required depth; other piles were then driven, and the foundations raised thereon.

9th. Although extremely expensive, the above mode of proceeding was absolutely indispensable to the security of the Masonry, to which it was also found necessary to give a greater breadth.

10th. It was my intention, on discovering the extra expense to which the work was liable, from the above-mentioned cause, to have suspended operations, and brought the subject to the notice of Government. The near approach, however, of the rainy season, and the insecurity of the upper ground behind the Rivetment Walls, which, had it given way in the slightest degree, would not only have rendered the construction of the Iron Bridge impracticable, but would have endangered the present one, made the unremitting prosecution of the work absolutely necessary. The Estimate for the walls in my letter of the 27th June 1823, is Sa. Rs. 3570, whereas the actual expense, according to the bills forwarded to the Committee, amounts to Rs. 9187 for the Masonry, and 6111 Rs. for the Embankment made to keep out the Tide during the work.

11. In reviewing the expenditure thus incurred, I beg it may be considered, that three unsuccessful attempts have been made at different times, and by different individuals, to erect a mass of Masonry on the banks of the Nullah, at or near the spot I selected, and I trust, that when the obstacles that have been surmounted shall be duly considered, the expense of the work will not be deemed extravagant.

12. The greater portion of the Chains are finished, and as soon as Government shall have decided on the expediency of adopting the improvement of the original plan of the Road Ways, which I had lately the honor of laying before the Committee, the construction of the Piers will proceed rapidly. The very decayed state of the present Kidderpoor Bridge, which has suffered fresh dilapidation from the late rains, more particularly on the Southern side, renders the speedy construction of the New Bridge extremely urgent.

13. I have given Captain Baker, my Assistant in this branch of my Department, directions for his guidance for the construction of the Bridge, and shall continue to do so until I leave the Presidency. I request, however, as Captain Baker has taken charge of the Yard, that from the 1st instant, the accounts of the Bridge Department may be transferred to him, and submitted in his name, and on his responsibility, during my absence with the Army.

14. With regard to the diminution of the Establishment employed in this Department, I beg leave to submit, that it is at present on a scale, that could not be diminished without greatly impeding the progress of the works. It consists of

- 1 Uncovenanted Assistant,
- 2 Overseers,
- 1 Sirkar,
- 3 Writers

The Apprentices I had the permission of Government to select from some of the Schools in Calcutta, have not as yet been borne on the strength of the Department.

15. A heavy expense, consequent on all new establishments of a similar description, has hitherto attended this, in the construction of Buildings, and the purchases and manufacture of Tools. This will now in a great measure cease, as a convenient Yard and Workshops have

been established, and stock of tools and materials laid in sufficient, with but a few additions from time to time, for the future use of the Yard.

16. Before concluding this part of my Report, I request the indulgence of the Committee to a few brief observations on the Establishment, which, although in its commencement may be said to have received the test of experiment, and to have realized in some measure the favorable hopes that were entertained of its utility.

17. The principal object of introducing Iron Suspension Bridges into India, was to avoid the heavy expense attending the construction of Bridges of Masonry, and by reducing the expense of these structures, to improve the communication by land generally throughout the Country.

18. That Bridges on the Suspension principle may be erected at a moderate cost, which may be defrayed in a short period by the imposition of a light Toll on passengers, I have already shewn in my report on the completion of the Kallyghaut Bridge, which would, by this time, have doubly repaid the expense of its construction, by the levy of a Toll equal only to that of the Ferry it has supplanted.

19. The two Bridges for the Nullahs on the Cuttack Road have been completed at an expense of less than 12,000 Rs. each, and have consequently further proved the economy of this description of Bridge.

20. To have constructed over the Nullahs in question, Bridges of brick Masonry, with a water way equal to that of the Iron Bridges, which is essentially necessary, as I have explained in my report of the examination of these streams, would have been attended with an expense of probably not less than a Lack and a half of Rupees each.

21. That these Bridges may be considered of a durable nature, and not requiring frequent repair has been ascertained from the fact, that after a minute examination, the iron work of the Ballyghaut Bridge was found not to have suffered any injury, either from the weather or from wear, during a period now of nearly two years. It has received no other attention than a coat of coal tar, the cost of which amounted to only eleven Rupees.

22. I would, however, suggest the expediency of a report being sent to me annually on the 1st of January, from the local officers under whose Superintendence the Bridges are placed, stating the condition of the iron and wood work, and that they have received the usual annual coating of coal tar, which is all that is required to preserve the iron from rust.

23. The substitution of iron for wooden beams in the Road Way, which I have from experiment found to be practicable, will render Bridges of this description little or not at all inferior to those of brick Masonry; nor will they be subjected to a heavier expense in repairs, the latter generally requiring repairs every second or third year, from the injury they usually receive in the rainy season by the overflowing of the stream, in consequence of the contracted span with which arches of brick Masonry must necessarily be built.

24. Considering, therefore, the economy and durability of Iron Bridges on the Suspension principle, their peculiar applicability to India, and the facility of defraying their expense by the levy of a Toll so light, and for so short a period, that it would not be oppressively felt by the population, their utility to Government by keeping open a Military communication throughout the country at all seasons of the year, and the indirect advantages that will arise from an increased cultivation and commerce, which has ever been found to follow a free communication and easy transport of produce, and the blessings such structures are to the inhabitants of a country generally, I trust the Committee will urge the support of Government to this useful establishment.

25. No measure would tend so materially to its prosperity as its constant employment. The difficulty of instructing workmen, and proving or correcting theory by practical observation, has now in a great measure been removed; certainty in construction has taken place of conjecture, and a regularity and exactness of work has been acquired by continued

and long established practice ; to suspend its operations would at once destroy the establishment, by relinquishing the advantages that have been attained, and I therefore humbly suggest, that on the completion of the Kidderpoor Bridge, some one of those now under consideration may be commenced.

26. A quantity of materials having been collected, the expense of the construction of Bridges will for sometime be light and gradual. Bridges for the Caramnassa River and the Soombah Nullah, have long been urgently desired, and although the want has been partially and temporarily supplied by a Rope Bridge at the former, the destructible nature of the material will soon render necessary a more permanant structure.

Canals.

27. The Canal operations upon which I have been engaged are the following :—

- 1st. Affording instruction to Mr. Schultz in the excavation of the Chooramonee Canal.
- 2d. Surveying and Levelling the Country between Channel Creek and Calcutta.
- 3d. Clearing the head of the Eastern or Bulliaghaut Canal, and erecting a Bridge over it at Kooliah, under the Orders of Government of 27th February 1823.
- 4th. Forming Embankments through the Salt Water Lake, under the same authority.
- 5th. Conducting the progress of the Great Eastern Canal.

Chooramonee Canal.

28.—

1st. This Canal is chiefly under the control of the Commissioner of Cuttack, with whom Mr. Schultz, the Executive Officer, corresponds. I have, however,* furnished him with Plans and Instructions for his guidance. The rate of expense at which he is conducting his work appears to be exceedingly moderate, but his progress is slow, from causes which I understand he has more fully explained to Government through the Commissioner of Cuttack.

Diamond Harbour Canal

29.—

2ndly. The progress made with this Canal, is a minute Survey of the Country with accurate Levels from the Hoogly River at Kidderpoor to Rangafulla, with observations and comparisons of the rise and fall of the Tide at Diamond Harbour

and Calcutta. An inspection of the accompanying Maps* and Memoir, prepared by Captain Taylor, will shew the care with which the several operations have been conducted. The Levelling of so great a distance as that between Chandpaul Ghaut and Diamond Harbour, where the accuracy of each day's work was proved by relevening, was necessarily a tedious and laborious, although an indispensable, operation. Capt. Taylor has, however, conducted it with much skill and assiduity, through a country generally unfavorable, and has collected information, which combined, with what I already possess, is sufficient for com-

mencing immediately on the Canal, whenever Government may order it to be undertaken.

30. Conceiving it not to be the wish of the Committee to enter at present on the details of this Canal, from its progress having been temporarily suspended by Government,

Captain Taylor's Maps.

* General Map.

Survey of Tolly's Nullah and the Sulloory.

Survey of the Diamond Harbour Creek

Survey of the Chingree Creek.

Survey of the bank of the River Hoogly from the Chingree Creek to Rangafulla.

Survey of the old Road, Ditches and Nullah, between Oostee and Hotogunge.

Survey and levelling section of the line of country between Rainapookreeah and Oostee.

I shall confine myself to the observation, that the Surveys and Levels coincide with, and corroborate in a remarkable degree those originally laid before Government by me, and shew in the clearest manner, that no natural obstacles exist to a successful accomplishment of the Scheme, and at an Expense somewhat less than the Original Estimate of 5 Lacks.

Ballighaut Canal.

31.—

3rdly. From the advanced season of the year at which I received the order of Government to clear the head of the Ballighaut Canal, I found it necessary to delay the operation until the close of the rains; a distance of 3,320 feet from the head of the Canal to the Bridge has been excavated to a depth of $4\frac{1}{2}$ feet, and an average breadth of 65 feet, the cost of which has amounted to 4,436 Rs. and 12 Annas, being 982 Rs. and 12 Annas in excess of the Estimate. The work, however, has been performed at the rate of $6\frac{1}{2}$ Annas per 100 cubic feet, being nearly half the rate at which Mr. Siret offered to undertake it in his Estimate forwarded to Government by Mr. Trower, Collector of the 24-Pergunnahs, in his letter under date 28th January 1823.

32. The broken brick arch of the Kooleah Bridge has been removed, and on the piers one of wood substituted, the expense amounts to Sa. Rs. 1,530 : 1 : 8, which exceeds the estimate by 530 : 1 : 8, in consequence of the difficulty and labour of removing the old brick work, and of erecting a temporary Bridge across the Nullah during the time the work was in progress.

Salt Water Lake.

33.—

4th. Owing to the very slimy nature of the soil in the Salt Water Lake, I found myself obliged to relinquish the formation of the Embankments through it until Dredging Boats could be prepared. Embankments have been, however, carried out a considerable distance into the Lake from the extremity of the Ballighaut Canal, and the anticipated effects of the Tide in the Canal, as stated in the 4th paragraph of my letter to Mr. Holt Mackenzie, dated 5th April 1823, were partially visible.

34. The expense of the Embankments amounts to only Sa. Rs. 1451 : 7 : 6. By the use of Dredging Boats, I have every reason to believe, that the eventual expense of the Bunds through the Lake, will not exceed the Original Estimate stated in the above mentioned letter.

Great Eastern Canal.

35.—

With two Maps.

5th. The operations on this Canal, with the exception of the purchase of Land in the vicinity of Calcutta, have been confined to the Excavation of two Cuts in the neighbourhood of Hosseinabad on the Jubunah River, and to clearing Jungle along the Chowmoon Khaul, the formation of Bunds, and clearing Jungle on the banks of the Dassar Khaul, which connects the Bayley Gunge and Hosseinabad Canals, and the Survey of the Country between Deacol and Hosseinabad.

36. The accompanying Plan, No. 1, shews the extent of Excavation of the Cuts above-mentioned, amounting to 11,259 running feet, or to a length of upwards of two miles.

37. It will be observable, however, that from having taken advantage of that part of the Dassar Khaul, which lies in a favorable direction, upwards of 5,000 feet of natural Navigation have been acquired. The whole extent Excavation, therefore, to complete the com-

munication between the Juboonah River at Hosseinabad, and the Chowmooh, which leads to Bussera, will be eight miles, three of which are nearly completed.

38. The expense attending the Operations of the Season, has been much greater than was originally contemplated. A Statement of my Proceedings from the Commencement of the Season, will render more intelligible the explanation I have to offer on this head.

39. During the Rains preceding the commencement of the Excavation, I was engaged in taking measures for the supply of Labourers. For this purpose, I dispatched some old inhabitants of the country in the vicinity of Baugundee, to collect information as to the number procurable, and from the reports I received, I expected to have been able to place 11,000 men at work, and it was with this anticipation I addressed a Letter to the Committee, under date the 6th of October last, wherein I stated the hope of commencing on the whole of the Canals at the same time; on proceeding to Baugundee however, I found so many of the Securities of the Contracting Sirdars objectionable, that the number of men for whom advances were given, was reduced to 3,800 for digging the Canals, and 800 for clearing Jungle.

40. By the 27th of November, 37 men were collected for clearing Jungle, and by the end of December, the number was increased to only 191 men. On the 16th of December, 230 men were placed on the Excavation, and by the end of the same month, only 1891 were procurable; and throughout the season the number of Labourers never exceeded 300 daily for clearing Jungle, and 2,000 for digging.

41. With the number of Labourers above mentioned, I commenced clearing the Jungle, for the Canal on the 27th of November, under circumstances very discouraging. The preceding rainy season was one of the most severe ever experienced in India, the ground through which the course of the Canal was to be carried, had been so long in a state of inundation, that the Labourers sunk over their knees in mud at every step. In this manner two miles of Jungle were penetrated.

12. The same cause also operated to impede the progress of the Excavations, the upper stratum of the soil being in so fluid a state, that it was with difficulty removed.

13. To shew the *ignorance* of the natives in the part of the country where we were engaged in the work on which they were employed, it may be observed, that when first the Excavations commenced, I found that the parties of 8 men, into which the whole were divided, dug during a day, no greater quantity than 9 feet square by 2 deep, or 162 cubic feet, notwithstanding every exertion on the part of the Overseers, my Assistant, and myself; the expense of the Calcutta Chouka, or 729 cubic feet, at this rate, amounted to no less than 4 Rs. and 8 Annas. I consequently requested and obtained the sanction of the Committee to enter upon contract engagements, and abolish the system of Day Labourers; after some hesitation, the Sirdars accepted contracts on the following terms; viz. 1 Rupee and 10 Annas per Calcutta Chouka in cultivated or cleared Ground; 1 Rupee and 14 Annas in Jungle land, at which rate the Canal has subsequently been excavated, or at an expense of 9,720 Rs. the mile, or within the Original Estimate of 10,000. Rs. the mile.

44. I also found at first a great aversion on the part of the natives to engage in clearing the Jungle, our parties were frequently reduced to one-half their number by desertions in the course of the day, I consequently entered into contract for clearing Jungles at the rate of 3 Rs. and 8 Annas the Beegah, &c.; the greater portion of the land for the Canal has been cleared at this rate. It exceeds the Estimate by 1 R. and 8 Annas the Beegah, but as the whole expense of clearing Jungle is only estimated at 1281 Rs. the excess in this item of expense will be inconsiderable.

45. Making tracking paths along the existing Nullahs, which are to form a part of the line of navigation, has been found more expensive than was at first contemplated, owing to the

soft pulpy nature of the upper stratum of the soil, as before noticed, which it was found necessary to remove to obtain earth of a sufficient degree of consistency to withstand the effects of inundation.

46. I have now I believe briefly enumerated the principal points of my executive operations, to which obstacles and difficulties were presented of no common description, these have, however, been happily overcome, nor are they likely to recur at a future period. The part I commenced on is the most difficult of the whole line, it is the only part wholly conducted through Jungle, at a distance from villages and fresh water. Perhaps I acted wrong in selecting it for the commencement of my work. Had I chosen a cultivated tract, my progress would have been more apparent, but as that I selected was the only one of which I had any doubts of success, I was anxious to be satisfied of the practicability of forming a Canal through it before the others were undertaken.

47. The chief cause therefore of the excess of expence of the Excavations beyond what was originally contemplated, may be looked for in the ignorance of the Labourers in the manner of conducting the work at its commencement, and in the natural difficulties of the country; yet before the close of the season, I have shewn in a former paragraph, that the expence was reduced within the Original Estimate, nor have I any reason for supposing it will in future exceed it.

48. In conformity with the instructions conveyed in the 2d paragraph of your letter, and after a most mature consideration of the subject, I now beg leave humbly to submit to the Committee my opinion, that the success of the Canals in question will be endangered by a present cessation of their progress. In a work of such magnitude, nothing less than unremitting exertion can possibly bring it to a successful close. Considerable progress, and that of the most desirable nature, has been made, in acquiring a thorough knowledge from practice (the only way of obtaining it) of the true manner of conducting the work, and in making it perfectly understood to the people generally, to whom its execution must be entrusted. To suspend its progress, would be to forego the advantages already acquired. The term of life in India is precarious, and when it is considered that the ground-work upon which the Undertaking is now proceeding, is the accumulated information of ten years of my own personal Survey and Observations in its minutest detail, the Committee will probably not regard this as the least among the present advantages, or of so little consideration as to be left to future contingency.

49. In the first paragraph of Mr. Holt Mackenzie's letter of the 30th July, the object of Government in wishing to suspend the work in question is stated to be, to "avoid any considerable disbursement in Works which are not of indispensable necessity." I shall now endeavour to shew, that the Work in question is more urgent and more indispensably necessary than when it originally received the sanction of Government, and that it may be conducted for sometime to come in a manner that will cause no considerable expenditure.

50. At the period the plan of the Canals in question was laid before Government, in August 1822, of the three principal communications between the Ganges and the Hoogly, the Baugretty and Matabanga passages were partially navigable, and it was confidently hoped by many, that by artificial means, they might be maintained so throughout succeeding years. Experience has, however, now fully proved, what was strongly urged in my original Memoir, the impossibility of keeping their Channels open by artificial means, or of controlling the enormous quantity of sand that is annually poured into them from the Ganges, although since the above mentioned period, various attempts have been made to accomplish so desirable an object. During the late Dry Season, both the Baugretty and Matabangah were wholly unnavigable, whilst the Jellinghee, which I had myself observed

in 1821, completely obstructed by sand, remained open for a short time after the rains of 1823, when it became unnavigable, to the great distress of the Inland Trade, and the only passage that then remained to Calcutta, was through the Sunderbunds and Tolly's Nullah, the inconveniences of which, whilst they indicate the necessity of the present Canal, have been so fully brought at various times to the notice of Government, as to render any remarks here unnecessary.

51. I shall now proceed to lay down for the consideration of the Committee, a plan for the future execution of the work, which, combining the utmost economy of which it can be susceptible with dispatch, will at the same time be found to embrace the objects of Government, as stated above. I have before shewn, that the most economical and surest mode of conducting the Excavation of the Canals, is by contract engagements for specific work, and it is evident, that it must be the most expeditious, as personal superintendence of its progress is required in a less degree than any other mode of working, and consequently, a greater quantity of work can be undertaken at the same time. I would therefore suggest, that the above arrangement be carried into effect by a minute survey of the line of Canal as a preliminary and indispensable measure, in the progress of which the ground to be excavated should be marked off and partitioned into lots, of an extent the most convenient for contractors, and that each lot should be distinctly defined by a boundary ditch. On the completion of this measure, or during the time it is going forward, contracts for the various lots might be received and registered, the respectability and means of securities ascertained, and such other necessary arrangements made, as would facilitate the progress of the Excavations whenever they may be undertaken.

52. Should Government accede to this suggestion, the immediate expenditure will be reduced to the personal Establishments of myself and Assistants, and to a few Labourers to work at and clear the ground for the purposes above mentioned,—the whole of the European and Native Establishment at present entertained may therefore be discharged, with the exception of the European Surveyor, Turner, to be placed under the Secretary to the Committee, to Survey the Estates purchased by them, and one Accountant and Writer, who will probably be found sufficient for the Office duties.

53. I have not as yet brought forward the outstanding balances of the Canal operations, the constant attendance in all works of a similar nature, whether conducted by Government or Individuals, such is the system now universally established throughout Bengal, that no work of any magnitude, like the one under consideration, can be performed without the agency of a set of individuals who are usually styled Sirdars, and to whom advances must previously be made, either for the supply of Labourers or for specific work. In the present instance, the Outstanding Balances amount to Rs. 14,844 : 9 : 5½. The reason of the balances being so heavy, is partly owing to my anxiety to push forward the Excavations, and partly to the necessity that existed of closing work by the end of May, from the great scarcity of fresh water, and consequent unhealthiness of the place, as I have before stated.

54. Should the Canal operations be continued, the contrary to which was never contemplated, the Outstanding Balances could be worked off by degrees in the ensuing season ; but if the work is closed, it will be necessary to resort to law to compel the securities to refund the advances the Contractors have received, a measure that will be attended with great distress to the individuals, and to a considerable portion of the population inhabiting the vicinity of the Canals, who have been engaged on the Excavations, and will I fear, create a feeling throughout the Country, greatly detrimental to the future progress of the work.

55. Legal measures for the recovery of the advances are, however, now in progress by the Superintendent of Law Suits, in whose hands the accounts have been placed.

56. As the purchase of the land for the Canal in the vicinity of Calcutta has rested exclusively with the Committee, I shall only observe, that the purchases already made, have I believe in every instance fallen short of the Estimate of 60 Rupees the Cottah.

I have the honor to be,

Sir,

Your obedient Servant,

CALCUTTA,
SUPT. OF CANALS' OFFICE,
19th October, 1824.

(Signed) J. AUG. SCHALCH, Major,
*Superintendent of Canals, and Agent
for the preparation of Suspension Bridges.*

P. S.—As the accompanying Maps are originals, I request they may be returned to my Office, after having been submitted to Government.

A true Copy,

CHARLES PATON,
Officiating Secretary Canal Committee.

No. 28. a

(Copy.)

TO CAPTAIN J. A. SCHALCH,

Superintendent of Canals.

SIR,

Herewith I transmit the Maps and Surveys detailed in the margin, which were

GENERAL MAP.
Survey of Tolly's Nullah and }
the Puttoory. }
Survey of the Diamond Har- }
bour Creek. }
Survey of the Chingree Creek, }
Survey of the bank of the Ri- }
ver Hoogly from the Chin- }
gree Creek to Rangafullah. }
Survey of the old Road }
Ditches and Nullah be- }
tween Oostee, and Hoto- }
mge. }
Survey and Levelling section }
of the line of Country be- }
tween Keimnapookreeh and }
Oostee. }

executed by me according to your instructions, with reference to the construction of the proposed Canal, to communicate with the New Anchorage, Diamond Harbour Creek, and Tolly's Nullah.

Though I hope the Surveyors themselves will afford the necessary information to enable you to mature your plans for the Canal, it may nevertheless be satisfactory to you to be put in possession of such remarks and observations as occurred to me in conducting the Survey, relating to the nature of the soil, supply of fresh Water, Population, and such other matters as are likely to come under discussion before the Canal Committee; but I regret that my ignorance of the Bengalee language, and the reluctance of the people themselves to afford information, operated to prevent me collecting much that would doubtless be of importance.

Previous to commencing the Survey of the proposed line of the Canal, careful Survey with sections of Tolly's and the Puttoory Nullahs was made as high up the latter as Bagesie, and the difference of Level between Chandpaul Ghaut and the ledge of a Temple at Keimnapookreeh, was ascertained by a series of levels taken with the utmost care, and proved by levelling back; the former will enable you to form a judgment of how far the Nullahs may be made available in constructing the proposed Canal. Tolly's Nullah at low Water in April is nearly dry, and entirely so immediately above the confluence of the Puttoory. The Puttoory at the section G. H. has but a depth of five inches at Low Water, both I imagine

would scour out to the depth required on opening the Canal, if the earth was loosened by raking, or any other process ; but as the stuff thus removed would be carried by the reflux of the Tide into the River Hoogly, it will be a question for consideration, if danger would not be incurred thereby, of a sand bank forming below the mouth of Tolly's Nullah, which would prove injurious to the Navigation of the River. It may, however, be remarked, that no such tendency has yet appeared, though the banks of Tolly's Nullah are washing away in several places, and consequently much earth and sand must be carried down ; on the contrary, there is now a depth of 50 feet at Low Water immediately below the mouth of the Nullah, and close to the bank. Secondly, that the direction of the Reaches of the River Hoogly, both above and below the mouth of Tolly's Nullah being calculated to throw the force of the current on that point, or near it, both in the flux and reflux of the Tide, the formation of a sand bank at that particular place is very improbable, and could only occur by some operating cause, giving the current a different direction to that which it holds at present.

The Levels were taken from Chandpaul Ghaut by the Brigeetullow, through Bowanepore and Russapugly, crossing Tolly's Nullah at Coodghutta Ghaut, giving the following results, which I combine with observations on the rises of the Tide at both places ; those in the Hoogly are on the authority of a Register kept by Mr. Kyd, and those in the Puttoory by myself :—

	<i>Fl. Inc. 10th</i>			
Kamapookrea, (the Temple,) is lower than the line marked on the Stone at				
Chandpaul Ghaut,	7	4	9	
The point of section C. D. (Map of the Puttoory,) is lower than the Temple,	2	2	6	
<hr/>				
The point of section is therefore lower than Chandpaul Ghaut,	9	7	5	
High Water Spring Tide in January is below this point,	0	5	2	
<hr/>				
Ditto ditto, lower than Chandpaul Ghaut,	10	0	7	
<hr/>				
Ditto ditto, in April, lower than the point of Section,	2	1	2	
<hr/>				
Ditto ditto, lower than Chandpaul Ghaut,	11	8	7	
<hr/>				
Low Water Spring Tides in April, lower than C. D.	6	9	1	
<hr/>				
Ditto ditto, lower than Chandpaul Ghaut,	16	4	6	
<hr/>				
Rise of the Spring Tide in April, at C. D.	4	7	9	
<hr/>				
The highest known rise of the Tide in the Hoogly, was below the line on the				
Stone at Chandpaul Ghaut,	2	6	0	
<hr/>				
The mean rise of the Tide in the Hoogly, from November until June, is below				
the Stone,	8	5	3	
<hr/>				
The mean of the least rise from November until June is,	14	9	7	
<hr/>				
The mean of the least rise from June until November,	11	7	6	
The mean of the Ebbs is below the Stone,	15	0	0	
<hr/>				

This abstract will appear more clearly, by reference to the Levelling Section Plan, where they are laid down, and the comparative states of the Tides will be comprehended at one view. The Tides at Kamapookrea are about one hour later than at Calcutta.

The General Map will shew the country through which the whole line of the Canal is to run, and how far its Excavation is likely to interfere with villages. In a Cut of such an extent, it cannot be expected that a line could be marked out which would run clear of every Village and preserve its direction. In a country so thickly populated, as that through which this Canal is to be cut, it is impossible. By reference to the Map it will appear, that if the Cut is made perfectly straight, it must go through many villages, but by a slight deviation some of them may be avoided, and where this cannot be effected without such a considerable sweep as would materially increase the distance and expence of cutting, it will not, comparatively speaking, be of much consequence to carry it through a village. The value of village ground was generally stated to be four times greater than the open cultivated land, and no unwillingness was manifested by the inhabitants to part with it, provided other places were assigned for their habitations. In the low grounds, particularly the Fresh Lake, the villages are compact, and may be avoided by a slight curvature in the direction of the Canal, but in the higher grounds the huts are scattered at such intervals, that the Canal might be carried through the centre of a village, without the necessity of removing more than fifteen or twenty houses perhaps. The greatest difficulty on this account may be anticipated at Gowriepoor, Meerpoor, and Kiristallah; at these places the huts are extensively scattered, and the villages so close, that any attempt to avoid one would lead direct to another, and one preponderating consideration against frequent deviation from a right line, is the increased action every curvature would inevitably give to the current on the sides of the Canal.

The point from whence I would propose the cutting to commence, marked A in the Levelling Section, and C II in the Map of Tolly's Nullah, is about 4000 feet South of Kamapookrea, where the section of the Puttoory gives a breadth of $31\frac{1}{2}$ feet, and a depth of 6. My reasons for fixing on this point are briefly, that from thence an uninterrupted plain extends for two miles South to Kurreempoor, and that going higher up the Puttoory, would carry the Canal too far East, for which there is no inducement in the Nullah itself, as it immediately contracts to a breadth of 25 feet, and becomes very shallow, the Tides flowing no higher than Bagesie. To satisfy the Committee, should any question arise on the subject, the survey of this Nullah was carried as far South as Jhinkee. From Bagesie for two miles, it is traced by a succession of stagnant pools of Water, and afterwards it can only be distinguished from the adjacent country by the marks remaining in it of the canoes which navigate it in the rains.

From the point above mentioned, as being eligible for the commencement of the Canal, the country is nearly on the same level for four miles; viz. about $4\frac{1}{2}$ feet above the level of the Low Water Spring Tides, which I have assumed as my base line of Levels, in the Levelling Section, (and to which, in speaking of the levels I shall always refer,) and is that Morass usually called the Fresh Lake; it there gradually rises until it attains its greatest height, which is $7\frac{1}{2}$ feet near Gowrypoor, when it again falls rather below the former Level to Oostee, giving a mean of 5.2 feet above the base line of Levels for the whole distance.

The Fresh Lake is inundated from the commencement of the rains until the middle of March. In January last, there was four feet water on it near Gopaulnugger, and communication between the villages was maintained by Canoes. These villages are raised but little above the Level of the Inundation, and the general mode of forming them appears to be, by excavating a number of small Tanks, and forming mounds with the earth so obtained on which the huts are erected.

The whole country between Kamapookrea and Oostee, appears by the soil and the weeds growing upon it, to be subject to protracted Inundation, and the inhabitants invariably stated it to be so, to the depth of three and four feet from the beginning of the rains, and draining off in February. From this general remark, must be excepted the higher ground alluded to above, which is a ridge that will cross the course of the Canal at Gowrypoor. It has no appearance whatever of being subject to Inundation, certainly not for any considerable time, though the inhabitants assert that it is. The soil instead of being the black heavy mould of the lower ground, is light and sandy, and cultivated for various productions different, from those of the other soil. It is enclosed, planted, and almost covered with huts and villages. This ridge can no way be avoided, except by a sweep of four miles to the eastward, for it extends from Jhinkee to the Diamond Harbour Road, and I believe on to the River Hoogly, fortunately it is not more than 4000 feet across from Meerpoor to the Southern extremity of Gowrypoor.

From Gowrypoor to Oostee, the soil is similar to that of the bed of the Fresh Lake, and apparently subject in the same manner to Inundation. The plain to the North of Oostee had three feet of water on it on the 1st of March last, but this was occasioned by the extraordinary high Spring Tides of the preceding month, and a heavy fall of rain. In the latter end of January, it was nearly dry.

At Oostee, the Creek from Diamond Harbour crosses the Old Road leading to Koolpee. I shall reserve the few remarks I have to make on this Creek, and state what further I have to say on the remaining part of the course of the Canal.

From Oostee to Hotogunge, the Ditch on the side of the Old Road may easily be made navigable, as will appear on reference to the Sections given with the Survey, and which were taken for every variation of breadth and depth. This Ditch is crossed in several places by small but deep Khals running from a Morass west of the Road, and communicating with the Sunderbuns. It finally joins the old Chingry Creek at Sawindah, which is shut up by a bund at Hotogunge, the great breadth and depth of this Creek above the bund, while scarcely a trace of it remains below it, shews, that if the Tide should be again allowed to act, and have access to the Ditch in the same manner it had to the Nullah or Creek, it would soon acquire sufficient breadth and depth, without any expence or trouble more than straightening its course when it crosses from one side of the road to the other; in other respects it is direct the whole way. The surface of the water at the bund at Hotogunge was $7\frac{1}{2}$ inches lower than that in the Ditch at Oostee, from which I conclude the fall of the country must be nearly the same.

NOTE.—There was a bund across the ditch near Sunderbuns.

At Hotogunge, the Spring Tide rises in the Chingree Creek below the bund about $1\frac{1}{2}$ feet, it is confined to a certain space by bunds, within which a considerable quantity of salt is manufactured; but owing to the Tide being debarred from a higher access by these bunds, the Creek is rapidly filling, and the people were engaged in deepening its bed, I presume, for the purpose of securing a continued flow of the Tide for the benefit of the salt works.

From the immediate neighbourhood of Hotogunge, the Old Road continues to Gopalnuggur, within two miles of Koolpee, where it is lost in the rice grounds, or beyond which it very possibly never was carried. The line of this road seems most eligible for the Canal, not only from its running exactly in the proper direction, but as being nearly free from any interruption from villages. No remains of any Ditch or Excavation that can be at all available for the Canal exists, except the very trifling one from Hotogunge to Chundeeppoor.

The road is said to be the property of the descendants of Rajah Nobkissun, who constructed it; as a road it is quite useless, but it may be of some value to the proprietors, on account of the Babool Trees which grow abundantly on it.

From Gopaulnuggur to the head of the Bhortullah Khal, which communicates with Channel Creek, the country is perfectly flat, a heavy black soil, apparently not very productive or much cultivated. No obstruction of any kind occurs except the villages, which are numerous and close, the line for the Canal will therefore be regulated with reference to the proximity of the River Hoogly, and the chance of its encroaching so as to join the Canal; of this there does not at present appear to be any probability. I surveyed and accurately examined the whole of the bank of the River from Diamond Harbour to the mouth of the Tengra Beechee Khal. From Diamond Harbour to Koolpee has nothing to do with the present consideration, further than it may be remarked, that the Kantaburya Point is calculated to direct the force of the Stream to the opposite side of the River, where Mr. Chalke, the Harbour Master at Diamond Harbour informed me, the bank was cutting away very fast; but even including this, there is no appearance of progressive cutting any where of the bank; on the contrary, at Low Water, there is from 400 to 1200 feet to the High Water Mark, and this more particularly from Koolpee to Rangafullah, as will be seen by reference to the Survey, which was made expressly to illustrate this subject.

Throughout the whole extent of the line of the Canal, the country is sufficiently populous to afford any number of hands required for excavating it. Should people from a distance be employed, a difficulty on account of fresh water might be apprehended to the South of Koolpee, where there is scarcely sufficient to supply the wants of the Inhabitants. Two or even three villages frequently depend on one Tank for Water; this does not occur from a paucity in the number of Tanks, they are numerous, but so ill secured against the Tides, that the water is generally spoiled.

Some part of the Canal will run through ground which is never cultivated, and when through cultivated ground it will generally be of that kind, which yields but one crop in the year of from four to six maunds of rice per Biggah. The value of the former ground is perhaps six Rupees per Biggah, and the latter was stated to be from 20 to 40 Rupees.

It now only remains for me to make a few observations on the state of the Diamond Harbour, Chingree, and Koolpee Creeks. The two latter are of little importance, they are both dry at low water, and can only be made available to supply the Canal with water, should it be necessary.

The Diamond Harbour Creek is navigable for large boats in all states of the Tide as far as Bagesie, (vide Map,) at which place there is water sufficient to float a 14-oared Pinnace at low water; above this however the Creek takes an abrupt turn, at a point where a large Khal, now closed, formerly joined it, the banks become steep and broken, and the bottom is choked with roots and stumps of trees; the breadth from this gradually diminishes to 25 or 30 feet, with a depth of six feet, and at Dyarack, where the Creek is bunded across, it is dry at Low Water below the bund. The course of this Creek winds very much, but with the exception of one or two places near Budertollah, the banks do not appear to suffer considerably from the action of the current. Many inferior Creeks communicate with it on both sides, but they are almost all closed by bunds. The Spring Tides rise above the banks the whole way, and are prevented, though not effectually, from inundating the country by bunds on each side, within the bunds of which a great quantity of salt is made.

The first principal turn of the Creek near the Bazar of Diamond Harbour, was partly cut across by order of Mr. Elliot, but as the Cut was never opened, it now serves as a Tank of fresh water, from which the Ships lying at Diamond Harbour are supplied.

From a Sluice near the Harbour Master's house, which was selected as a permanent station, a series of Levels, very carefully taken and proved by levelling back, were carried on to Oostee and terminated at a stake four feet long, driven into the ground at the point

where the Canal will probably join the Old Road, the result of these Levels, and my observations of the rise and fall of the Tide at Diamond Harbour, are as follows:—

Ft. In. 10ths.

The Head of the Stake at Oostee is lower than the Ledge of the Sluice at									
Diamond Harbour,	...	...	...	...	...	...	4	9	8
The Head of the Stake is above the base line of Levels,	...	...	...	...	...	...	6	2	2
The Ledge therefore is above the line of Levels,							11	0	0
Ditto above the low water Spring Tide Mark in February,							20	8	7
The greatest known rise of the Spring Tides, was above the Ledge,							3	5	3
The Spring Tide in February, was below the Ledge,							1	6	6
Mean rise of the Spring Tides, below the Ledge,							3	5	7
Lowest Ebb of the Neap Tides in May, below the Ledge,							17	4	7
Least rise of the Neap Tides in May, ditto,							7	7	4
Rise of Neap Tide in March, according to Mr. Chalk,							13	10	3
The actual rise of the same Tide was,							5	0	0
The Ebb therefore must have been, below the Ledge,							18	10	3

As the Ebbs correspond with the Flows of the Tide, that is, the higher a Tide rises the lower the Ebb falls, and the contrary; it would appear, on comparing this result with those above detailed, that the observation was inaccurate. Mr. Chalk was certain as to the actual rise of the Tide being five feet, but as he could not point out exactly any spot to which it rose, but only generally in the bed of the inlet near the Jetty, which was choked with soft mud, it is probable an error occurred in obtaining the difference of Level between it and the Sluice Ledge, and it is probable it rose to within ten or eleven feet of the Ledge.

On comparison of the rises of Tide at Diamond Harbour, with the Surface Level of the Canal at Oostee; viz. six feet above the base line of Levels, it is observable that in cases of extraordinary low Neap Tides, they will not rise to the Level of the Canal, and that frequently in high Spring Tides they will rise above it, but none of these rises are applicable at Oostee. For the Tide flowing in a confined Channel, a distance of nine or ten miles will be considerably retarded by friction against the sides and bottom of the Channel, so that the actual rise at Oostee will never correspond with the actual rise at Diamond Harbour. The very high Spring Tide in February last, rose about a foot on the plane North of Oostee; viz. about $5\frac{1}{2}$ feet above the base line of Levels, while it rose at Diamond Harbour 9 feet and 5 inches above the same line, giving a difference of 3 feet 11 inches as the loss of rise. If this result were applicable to all rises of the Tide, it is obvious that the generality of the Neap Tides would barely rise to the Level of the Canal, and some scarcely so high, without any allowance for the rise of the Tide in the Canal itself, which is likely to be contemporaneous; but it is not probable that the decrease of the rise in Spring and Neap Tides will be equal, on account of the diminished velocity with which a smaller body of water flows in the same Channel. It will therefore be for consideration, if a Sluice at Oostee is adapted to keep the

communication open? If Locks must not be substituted? Or if some point between Oostee and Diamond Harbour might not be selected, where a more equable rise of the Tide would render Sluices available.

With reference to the construction of Sluices or Locks at Oostee, a well was sunk there to the depth of 25 feet, to ascertain the nature of the soil for a foundation at that depth; the workmen came to sand, and the water gained so fast on them, that the well could not be kept clear; further prosecution of it was therefore necessarily abandoned, and the water immediately rose 15 feet. The whole of the neighbouring country being inundated, and the Ditch on the road side full, may partly account for this occurrence. The following is a Table of the strata :—

1st. Light brown Clay, mixed with vegetable matter,	..	..	..	4 Feet.
2nd Brown Clay, mixed with some sand,	..	..	..	2 „
3rd. The same, darker and veined with ochre,	..	..	..	2 „
4th. Dark blue terraceous Clay,	..	..	..	6 „
5th. Light blue Earth and Sand,	..	..	..	5 „
6th. The same, but more sandy,	..	..	..	6 „

Specimens of these different strata were brought to Calcutta, when the brickmakers declared the two last to be of an excellent quality for making bricks, with the addition of a little more sand.

I trust, I have not omitted any thing of consequence in the above communication; but if I have, I shall be happy to supply the defect as far as may be in my power, if you will inform me of it.

I am,

Sir,

Your most obedient servant,

(Signed) *J. W. TAYLOR,

Assistant Superintendent of Canals.

(A true Copy,)

CHAS. PATON,

Officiating Secretary, Canal Committee.

Qy. T. M. Taylor.
J. M.

CALCUTTA,
August 28, 1824.

No 29.

To HOLT MACKENZIE, ESQ

Secretary to Government in the Territorial Department.

No. 99.

SIR,

I am directed by the Canal Committee to acknowledge the receipt of a Letter from you, under date 30th of July last, informing the Committee, that Government had determined to postpone the prosecution of the Channel Creek and Diamond Harbour Canals, and requiring them to submit a succinct account of the progress of the Eastern Canal, together with their opinion on what reduction of Establishment can be made in that or the Iron Bridge Department, with reference to the entire or partial Suspension of the Works now going on.

2. Having called on Captain Schalch for his sentiments, with regard to the proposed reductions, the Committee have received from him a Report, dated the 19th ultimo, of which a copy is herewith transmitted. Captain Schalch has divided the subject of his Letter into two parts, and the Committee propose in the first instance to follow his example in offering such remarks as have occurred to them on a consideration of it, reserving for the conclusion of this letter any observations of a general nature, which the conduct of the duties confided to them may suggest.

3. First, on the subject of Iron Bridges since the receipt of Captain Schalch's Letter, the Committee have received the orders of Government, (dated the 15th ultimo,) on the subject of the Bridges on the Cuttack Road, adverted to in the 2nd and 3rd Paragraphs, and no time will be lost in having them forwarded to Balasore. The Committee beg to suggest, that the Military Board may be requested to obtain from the Barrack-master at Benares, his opinion and estimate on the Bridge proposed to be built over the Soombah Nullah.

4. The Committee cannot but regret that the expense actually incurred in the construction of the Rivetment Walls for the New Bridge at Kidderpore,* has so far exceeded the sum originally contemplated, at the same time they deem it an act of justice to Captain Schalch, to bear testimony to the difficulties which he had to contend with in sinking the foundations of the Masonry, and to his indefatigable exertions in overcoming them. The Committee think it desirable, that Captain Schalch in submitting any future Estimate for the erection of Suspension Bridges, should make a liberal provision for contingencies of this nature, which are always liable to occur, and cannot be guarded against, in order that the Government may be better able to determine on the expediency of any work proposed with reference to the expenditure likely to be incurred in its execution.

* Vide Para. 7, 8, 9, 10, 11, 12, of Captain Schalch's Report.

	Rs.	
Actual Expense of Walls	9,187	
Original Estimate, ..	3,570	
	<u>5,617</u>	
Additional for Embankments,	6,111	
Total ..	11,728 excess.	

5. Assured as the Committee are, that the sum in excess of the Original Estimate for the Rivetment Walls at the Kidderpore Bridge has been necessarily incurred, and that the expense has originated in causes beyond Capt. Schalch's control, they beg to recommend that it may be authorized by Government. The improvement noticed in the 12th Paragraph having been sanctioned by the orders contained in your letter of the 8th ultimo, the construction of the Piers will be immediately proceeded upon, under the Superintendence of Captain Baker, who has been instructed to take charge of the Iron Bridge Department, and to submit his Accounts in the prescribed form, during the time we are deprived of Captain Schalch's services.

6. Adverting to the remarks contained in the 14th and following Paragraphs of Captain Schalch's Report, on the subject of Iron Bridges, to the important benefits which will accrue to the Public from their more general introduction, and to the facts, that if a moderate Toll be levied on the Bridges wherever constructed, the Government need not ultimately be put to any expense on account of them; the Committee are induced strongly to recommend that the Establishment now kept up for carrying on the business of preparing them may not be reduced, and that the Bridges over the Coramnassa River and Soombah Nullah, which have been long in contemplation, should be proceeded upon.

7. Wherever they may be erected, the Committee are of opinion, that the Report suggested in the 22nd Paragraph of Captain Schalch's Letter, should be made to him annually, by the Magistrate of the District, or the Barrack-master of the Division in which the Bridge may be situated, informing him of the state of the Bridge, and of any repairs that it may require.

	Rs.	
On account of Bridges,	83,857	
Ditto of the Yard,	16,066	
	<u>1,04,923</u>	

8. It will appear from the annexed abstract Statement* of expenditure incurred from the appointment of the Committee in March 1823, up to the 31st of July 1824, that Captain Schalch has drawn the sum of 1,04,923 Rs. on the Suspension Bridge and Yard Account. to

* Appendix B.

which is also chargeable the salary of his Assistant, Captain Baker, amounting to Sa. Rs. 2,633.

9. During the above-mentioned period, the following expenses having been actually incurred on account of the Bridge Department and Work Yard, leaving a Balance in his hand, Sicca Rupees 4,313 : 15 : 1½ to be hereafter accounted for.

The Bridge of Kally Ghaut,	Sa. Rs.	13,922	4	3½
„ „ Roadway to the Kally Ghaut Bridge, .. .. .	..	2,882	0	5
„ „ Two Bridges for the Cuttack Road, .. .. .	..	20,108	2	10
„ „ Establishment, .. .. .	..	3,417	2	6
*Purchase and manufacture of Tools, .. .. .	..	5,538	9	10
*Materials, (wholesale purchase of Iron,) .. .. .	..	15,998	9	7
Contingent charges of the Yard,	7,630	1	10	
*Railing off the Iron Bridge Yard,	2,471	10	5	10,101 12 3
Kidderpore Bridge, .. .. .	..	28,640	7	2
<hr/>				
		Sa. Rs.	1,00,609	0 10½

The three items marked [thus*] may be considered as so much stock in hand.

10. The Committee proceed next to advert to Captain Schaleh's Report on the Canal operations.

The Chooramonce Canal being under the immediate control of the Commissioner of Cuttack, the Committee do not feel themselves called upon to offer any observations on the progress of that work.

11. In that to Diamond Harbour, which forms the subject of the 29th and 30th Paragraphs of Captain Schaleh's Report, the Committee are naturally induced to take a more lively interest, and they cannot refrain from expressing their extreme regret, that after all the trouble and expense that has been incurred, Government should have come to the determination of postponing the prosecution of this important work, in which the Mercantile interests of the country, and the prosperity of the Metropolis are so deeply engaged.

12. The Committee, however, are not without hope, that when the beautifully executed and minute Surveys made by Captain Taylor, with the Memoir which accompanies them, shall be laid before Government, the continuation of this Canal will not be suspended.

13. At all events the Committee venture to suggest, that an opportunity may be afforded to the Mercantile body of the City, who are most interested in the measure, or to other Individuals, to carry the Work into execution by means of private subscriptions, in the way that works of a similar nature are carried into effect in England.

14. The Committee are induced to offer this suggestion under the apprehension, that if once the prosecution of the Canal is suspended, a considerable period may intervene, during which many alterations may take place to affect the data on which the practicability of the work has now been ascertained; the services of the officers who have been engaged in the preliminary enquiries may not be available, and consequently a double expense will be incurred in obtaining the information which has been acquired by Captain Taylor's Surveys.

15. Should this proposal meet the approbation of Government, the Committee are of opinion, that it will be of essential importance to the success of the undertaking, that the Canal Society should be allowed the benefit of Captain Schaleh's and Captain Taylor's services in the execution of it, and that a certain number of shares should be taken by the Government as an encouragement to the Work.

16. The expense incurred in Captain Taylor's Survey up to the 31st of July 1824,

Salary,*	Sa. Rs.	6,800	0
Allowances,		3,258	0
Contingencies, ..		531	10
		10,592	10
In Excavating†			
the Canal,		982	12
In the Bridge, ..		530	1
	Sa. Rs.	1,512	13
		8	

amounts to Sa. Rs. *10,592 : 10.

17. In the Excavation of part of the Balliaghaut Canal, and the erection of a new Bridge at Kooleca, some additional expense beyond the original Estimate has taken place, but the explanation afforded in the 31st and 32nd Paragraph of Captain Schalch's Report appear to the Committee satisfactory, and they beg to recommend that those sums may be sanctioned.

18. The experiment made of carrying the Canal through the Salt Lake, (Paragraph 23rd and 24th.) by the formation of Bunds for preserving the Channel, as far as it could be tried without the aid of Dredging Boats, seems to have answered Captain Schalch's expectations. The building of these Boats should be immediately commenced upon, and so soon as they are completed, he will be enabled to proceed in this portion of the Eastern Canal, which promises to be of great Public utility in securing a free communication with the City from the Sunderbunds, whence the supply of wood and fish is chiefly derived, even if circumstances should render it necessary to defer for the present the extension of the line of Canals farther to the Eastward.

19. The expenditure hitherto incurred on account of those Canals, and the impolicy of suspending them altogether, forms the next and subsequent Paragraphs of Capt. Schalch's Report; and from a full consideration of the arguments adduced by that intelligent officer, the Committee are induced to coincide with him in the inexpediency of altogether relinquishing the undertaking, and to recommend that the Plan which he has proposed for the gradual accomplishment of it, may be adopted.

20. The Committee must acknowledge, that the progress of the work hitherto has not equalled the expectations which they had formed, nor has it been commensurate to the expense which has been incurred; at the same time they are of opinion, that the experience acquired in a new and difficult undertaking will not be without its utility, and that the explanations afforded by Capt. Schalch, warrant a reasonable and well grounded hope, that the ultimate expenditure on account of excavating the Canal, will not in any considerable degree exceed what was originally contemplated.

21. From the details entered into by Capt. Schalch, the Committee conceive, that the little progress made in the Canal, and the large expense which has attended it, may be ascribed to the following causes:—

1st. To the difficulty of obtaining a sufficient number of Labourers.

2nd. To the excavation of the Canal having been commenced at the most difficult point of the whole line.

3rd. To the employment of an establishment adequate to the prosecution of operations embracing a considerably more extended line of the Canal, than it was found practicable subsequently to effect.

22. Whilst, however, these several causes may have operated against the progress and economy of the work, it must be recollected, that the knowledge of them has been acquired by experience, and that it would be in the highest degree unjust to Captain Schalch to assume, that he might and ought to have guarded against them.

23. The scene of his operations, and the mode of conducting them, was of course left to that officer, and the reasons he has assigned for beginning them at the most difficult point, carry with them considerable weight. It is easy for the Committee now to observe, that had the Excavations been commenced upon in a more open and accessible part of the line, much greater progress might have been effected at a comparatively smaller expense; that less difficulty would have been experienced in obtaining workmen; that the people employed upon the work would have been kept more easily to it; and that upon the whole,

the prospect of ultimate success in the undertaking would have been apparently far more satisfactory and encouraging

21. It is, however, no small satisfaction to the Committee, that a considerable portion of the most difficult part of the Canal has been accomplished; and it will be observed by the 42nd Paragraph of the Report, that in the latter stage of the operations, the Excavations were made within the Estimated rate of 10,000 Rs. per mile, and that Captain Schaleh entertains no apprehensions of that rate being exceeded in future.

25. It appears, (Paragraph 36,) that nearly three miles of the Canal have been completed up to the 31st of July, Captain Schaleh had expended on account of this Canal

Excavating the Canal, Rs. 27,165 1 6½	Rs. 99,324:0:8½, exclusive of his salary and allowances,
Cutting Jungle, 5,270 7 0	amounting to 28,831 : 10, and the salary of Lieutenant
Making Bund, 373 11 6	Prinsep, amounting to 3,746 : 0 : 0, making altogether
Establishment, Overseers &c. 10,495 14 0	the sum of 1,31,895 : 10 : 8½, chargeable to the Canal
Contingencies and Tools, 9367 3 5½	Department.
Dredging Boats, 30,807 11 3	
Outstanding Balance, .. 15,844 0 0	
Rs. 99,324 0 8½	

26. From this sum, however, Sa. Rs. 30,807 : 11 : 3 is to be deducted on account of the Dredging Boats, which have been transferred to the Military Department, and 15,844 Rs. on account of Outstanding Balances, which remain to be worked off, making the expense actually incurred in excavating the Canal and the Contingencies attending it, Sa. Rs. 85,243 : 15 : 2½, or Sa. Rs. 28,414 : 10 : 5 per mile, for that part of the work which had been done.

27. With regard to the Plan of future proceedings proposed by Captain Schaleh, (Paragraph 50 and 51,) the Committee are disposed to consider it the most judicious that can be suggested. They would not, however, recommend that the whole of the Establishment (with the exception noticed in the 51st Paragraph,) should be discharged. Some few Overseers will, they think, be absolutely necessary to Superintend the Workmen, even on the reduced scale of operations proposed; at the same time they are of opinion, that it is desirable to employ Natives instead of Europeans, who have been found little able to bear the effects of the sun and damp to which the nature of the duty exposes them. By this arrangement, too, a considerable expense will be saved in the Salaries of the Overseers, and it may not be necessary to retain them during the rains, (as has been the case with the Europeans,) when the Excavation of the Canal must necessarily cease.

28. The following is a List of the Establishment as it existed when the greatest quantity of work was going forward, and of the Establishment which will be required on a reduced scale, framed in concert with Captain Schaleh:—

ESTABLISHMENT

as it existed when the greatest quantity of work was going forward by Day Labourers, not including the Establishment of the Committee.

8 European Overseers, at 30 Rs. each,	Rs. 240 0 0
1 Ditto,	60 0 0
1 Ditto for Dredging Boats,	60 0 0
1 Ditto,	20 0 0
1 Accountant,	80 0 0
1 Writer,	30 0 0
1 Mofussil Cash-keeper,	40 0 0
1 Bengalee Mohurer,	25 0 0
1 Jemadar,	10 0 0
Carried forward,	Rs. 565 0 0

Brought forward,	Rs. 565 0 0
59 Burkundazes, at 6 Rs. each,	354 0 0
1 Native Doctor,	30 0 0
2 Mofussil Sircars, at 25 Rs. each,	50 0 0
1 Sircar at Salt Water Lake,	25 0 0
1 Ditto at Mofussil,	10 0 0
1 Chowkeedar at Salt Water Lake,	6 0 0
1 Writer at Mofussil,	25 0 0
1 Accountant at ditto,	80 0 0
1 Chowkeedar at Kooleea Bridge,	5 0 0
3 Calassees at the Dredging Boat,	15 0 0
1 Head Shikaree,	8 0 0
10 Shikarees, at 6 Rs. each,	60 0 0
1 Chowkeedar at Mofussil,	5 0 0
<hr/>	
Per Mensem, Rs. 1,238 0 0	
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ESTABLISHMENT

that will be required in the reduced Scale, not including the Establishment of the Committee.

8 Native Overseers, at 16 Rs. each,	...	...	...	...	Rs.	128	0	0	
1 Accountant,	...	...	...	...	...	...	80	0	0
2 Sircars, at 25 each,	...	...	...	...	...	...	50	0	0
3 Writers, at 20 Rs. each,	...	...	...	...	...	...	60	0	0
1 Head Shikaree, at 8 Rs.	} in those parts only where there are Jungles, }	...	...	...	...	...	68	0	0
10 Shikarees, at 6 Rs. each,									
2 Chowkeedars, at 6 Rs. each,	...	...	...	...	...	...	12	0	0

Per Mensem, Rs. 398 0 0

29. A considerable part of the larger Establishment has already been discharged at different times; of the smaller one, Captain Schalch will retain at present only such part as may be required for the immediate duties of this office. The Overseers and Shikarees will not be employed till the working season, when the small Establishment above stated, with from 50 to 100 Labourers, will form the whole expense of the Canal operations, exclusive of the Salaries of Captain Schalch and Lieutenant Prinsep.

30. As far as circumstances may admit, Captain Schalch will of course afford, to those who have received advances an opportunity of working off the Outstanding Balances against them, which, under other circumstances, can only be recovered by legal process.

31. The purchase of land in the vicinity of the Circular Road, for the purpose of connecting the Eastern Canal with the Hoogly River near Chitpore has, as stated in the concluding Paragraph of his Report, been conducted under the immediate Superintendence of the Committee, aided by their Secretary; up to the 31st of July 1824, the sum of 1,08,306 Rs. has been expended on that account, and since that date, further purchases have been made,

† 52 Rs. is the average inclusive of Buildings, 40 Rs. exclusive of them.

the whole of which will be found in a statement appended* to this address, shewing that the average rate of the ground hitherto purchased, including Buildings, has fallen considerably short of the sum of 60†

Appendix A.

Rs. per Cottah, originally contemplated.

32. It is not unknown to Government, that the Committee has experienced some difficulty in effecting these purchases, which might, however, have been carried to a greater extent, had not the Committee been anxious to proceed in the first instance without the intervention of Arbitrators under the Provisions of Regulation I. 1824. The progress of improvement in the City always accompanied, as it has been, with an increase in the value of Premises adjoining any Road opened by the Lottery Committee, has rendered the acquisition of ground to an extent necessary to secure the quantity of Land required for the Canals, Roads, and Surplus Ground for resale, a matter of difficulty, and in a very early stage of their proceedings, the Committee discovered that combinations had been entered into to defeat the objects they had in view.

33. In some instances these were overcome, and in others they will be eventually surmounted by calling in the aid of the Regulations above-mentioned, but the consequence has been, that the purchases have been made in detached parcels on the intended line of Canal, and the Committee apprehend, that if this part of their operations is suspended, the difficulty of obtaining hereafter the intermediate spots will be enhanced, and the ultimate expense of purchasing them greatly increased. It may be also urged in favour of going on with these purchases, that the ground may be resold without loss, should the entire abandonment of the Eastern Canals, (which the Committee do not contemplate,) be at any time determined upon. Indeed, the Committee are of opinion, that the opening of a communication between the River North of the Town, and the Salt Lake and Sunderbund Rivers, would be attended with important advantages to the Internal Commerce of the Country, even if circumstances should render that measure indispensably necessary. For the foregoing reasons, the Committee do not hesitate to recommend that their proceedings in this branch of their duty may not be interrupted. In the event of this arrangement meeting the sanction of Government, the Committee are desirous of being authorized to retain Mr. Turner in the capacity of Surveyor on his present allowances, for the purpose of completing the Surveys and Plans of premises purchased for this part of the Canal, as he would otherwise be discharged on the reduction of the Establishment. It will also be necessary to entertain on the Secretary's Establishment, an additional Native Ameen at 20 Rs. per mensem, to attend Mr. Turner, and point out to him the situation and boundaries of the parcels of Ground, to be inserted in his Survey.

34. Having thus far delivered their sentiments on the several points noticed in Capt. Schalch's Letter, the Committee feel it incumbent upon them to offer, in conclusion, a few general remarks on the various and extensive duties which have devolved upon them since their first appointment, and on the prospect they entertain of bringing them to a successful termination.

35. In March 1823, the Committee was appointed for the express purpose of Superintending the construction of a line of Canals, with a view to facilitate access to the City from the Eastern Districts of the Lower Provinces, by which the important object of a safe and permanent communication with the Ganges at all seasons of the year was also contemplated. Captain Schalch was placed under their control as Agent for the preparation of Iron Suspension Bridges, to be erected in different parts of the Country, and shortly after this, the scheme of opening a Canal to Channel Creek was brought forward, the conduct of which was also committed to their Superintendence.

36. The Committee are not led to these observations by any wish to shrink from the duties which have been thus assigned to them, but for the purpose of adverting to the magnitude of the responsibility which they involve, and soliciting the consideration of Government to the expediency of their having the means of conducting them with efficiency and regularity.

37. The Committee allude more particularly to the changes which have already

taken place in the several Officers placed under their instructions; within the short period of its appointment, the Secretaryship of the Committee has been in three different hands. Captain Schaleh has been once deputed on special duty to Chittagong, and the Committee are now informed that Captain Taylor and himself [Capt. Schaleh] have been placed at the disposal of the Commander-in-chief, by which the Committee are likely to be deprived of their valuable services for a length of time.

38. As the Projector of Canals and Suspension Bridges, the Committee have relied with implicit confidence on the best exertions of Captain Schaleh towards their successful completion; and without detracting from the merit of those to whom the prosecution of these works may be consigned, it may be fairly doubted, whether those persons will take the same intense interest in their success that Captain Schaleh must naturally feel; the Committee therefore venture to express a hope, that whenever circumstances will admit of it, Captain Schaleh may be immediately directed to resume charge of the Superintendence of the above work.

39. The Committee deem it their duty to observe in this place, that the accounts of the works carrying on, have not been always submitted by Captain Schaleh with that regularity which is essential to the exercise of an efficient check upon the expenditure. This is in some measure owing to the interruption which has occurred from Captain Schaleh's absence on Military duty at Chittagong; but the Committee think it desirable, that strict injunctions should be issued to the Officers acting under them, that the accounts of one month should never be postponed beyond the 15th of the next, and that an abstract account should be regularly furnished at the end of each quarter, of the Receipts and Disbursements of the preceding three months.

40. Without greater attention to this point, it is impossible for the Committee to form a judgment how far the progressive expenditure may bear proportion to the expense originally contemplated, when the several works received the sanction of Government.

41. Under the assurance from Captain Schaleh, that the Excavation of the Canal will not in future exceed the rate of 10,000 Rs. per mile, on which his calculations were first made, it is unnecessary that the Committee should again advert to the high rate at which the Excavations have been commenced. But the Committee conceive it incumbent upon them to prepare the Government to expect, that the expense of Superintendence, Establishment, and other Contingencies, are likely to exceed in a very great degree the original estimate.

42. In the 59th Paragraph of the Report of the Special Committee, dated 20th March

Captain Schaleh's Salary, Sa. Rs.	16,366	10	0
Ditto Allowances,	12,465	0	0
Canal Establishment,	10,495	14	0
Contingencies and Tools,	9,367	3	5
Lieutenant Prinsep's Salary, ..	3,740	0	0
Secretary's Salary,	3,280	0	0
Ditto Allowances,	1,500	0	0
Ditto Office Establishment, ..	6,085	0	0
Ditto Contingencies,	3,936	4	7
<hr/>			
Sa. Rs.	67,236	0	0

1823, the expense on these heads is computed at 1,00,000, or at most 1,25,000 Rupees on account of the Eastern line of Canals, whereas it will be found, if the salaries and allowances of Captain Schaleh, Lieutenant Prinsep, and the Secretary to the Committee are taken into the account, and the expense of the inferior Establishments and Contingencies

added to it, that the charge on those several heads up to the 31st of July 1824, amounts to the sum of 67,236,7 Sa. Rs.

43. If this is taken as the expenditure of 16 months, the average per mensem will be Rs. 4,202:4 and allowing five years for the probable period of completing the Canals, the expense of Superintendence, &c. will be 2,52,135, instead of 1,25,000 Rs. as originally provided for. It certainly might be urged, that the inferior Establishments, under the new plan of operations, will be less expensive, and the contingencies smaller, but then it must be recollected, that the work will be far less expeditiously carried on, its probable termination extended to a more distant period, and consequently the ultimate expenditure on those accounts much larger

44. It is not clear, however, from the report of the Special Committee, that they reckoned on the Salaries and Allowances of the Officers abovementioned being included in the expense of Superintendence, the only Establishment specifically provided for in the report (vide Paragraph 73,) are 13 European Overseers, with the same number of Sircars and Boats, and in Paragraph 77, the Committee distinctly anticipate the performance of the duties of the Secretary by the Junior Member of the Controlling Committee.

45. The Committee would not wish it to be understood from the foregoing observations, that they entertain any doubts of the success of Captain Schalch's Plans, or of the important benefits which will in the end accrue to the Country at large from their completion; at the same time they have deemed it their especial duty not to conceal from the Government the results of the experience which has been obtained during the progress of their operations.

46. It is requested that the Plans and Surveys forwarded herewith, may be returned when no longer required.

I have &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
18th November, 1821.

(Signed) CHARLES PATON,
Officiating Secretary, Canal Committee.

APPENDIX B.

A'stract Statement of all Sums drawn and expended on account of the undermentioned Works, from their commencement up to the 31st day of July 1924.

CANALS.

Captain Schalch.					Captain Taylor.			Lieut. Prinsep.		Secretary.							
Draft.	Per Ac- count Current.	Salary.	Allow- ances.	Total.	Salary.	Allow- ances.	Contingen- cies.	Total.	Salary.	Pur- chase of Land.	Dredging Boats.	Contin- gencies.	Estab- lish- ment.	Salary.	Allow- ances.	Total.	Grand Total.
51,600	32,428	16,366 10 0	12,465	1,42,859 10 0	6,800	3,253	534 10 0	10,592 10 0	3,740	1,05,306	3,219 12 2	3,936 4 7	6,055	3,280	1,500	1,26,427 9 0	2,83,619 4 9

BRIDGES.

Captain Schalch.		Lieutenant Baker.	
Draft.	Per Account Current.	Salary.	Total.
66,857	22,000	83,857 0 0	2,633 3 4
			91,490 5 4

YARD.

Captain Schalch.		Captain Schalch.	
Drafts.	Per Account Current.	Salary.	Total.
16,065
			16,065 0 0
Down by Capt. Schalch on Canal Account, exclusive of Salary and Allowances, 1,14,028 0 0			
Ditto ditto Bridge Account, 58,857 0 0			
Ditto ditto Yard Account, 16,065 0 0			
2,18,951 0 0 up to 31st July, 1924			
Expended by Capt. Schalch on Canal Account, 90,747 13 6			
Ditto ditto Bridge, 84,023 2 8			
Ditto ditto Yard, 16,585 14 2			
1,91,355 14 5 up to 31st July, 1924			

(Signed) C. PATON, Officiating Secretary, Canal Committee.

2,18,951 0 0
1,91,355 14 5

(Signed) H. SHAKESPEAR,
C. R. BARWELL

27,594 1 7 Balance in Capt. Schalch's hands on 31st July, 1924.

No. 30.

To C. PATON, ESQ.

Officiating Secretary to the Canal Committee.

Revenue, the 24th December 1821.

SIR,

I am directed by the Right Honorable the Governor General in Council to acknowledge the receipt of your Letter, dated the 18th ultimo, together with the Reports and Plans submitted by Major Schaleh and Capt. Taylor, and to communicate as follows:—

Suspension
Bridges.

2. Under the circumstances stated in the 6th and following Paragraphs of your Letter, and in the Papers therein referred to, His Lordship in Council concurs with the Committee in thinking it advisable, that the Establishment now kept up for carrying on the business of the Iron Bridge Department should be continued, and that the Bridges proposed to be constructed over the Coramnassa River and the Sombah Nullah should be proceeded upon.

3. His Lordship in Council is not immediately prepared to determine how far the levying of Tolls could be expediently attempted. If any where attempted, the experiment should first be tried in the vicinity of the Presidency, and of Stations where an European Officer resides: and, other things being equal, a preference should be given to places where Police and Custom-house Chowkees are fixed, and where a part of the community at least are already subject to detention. Whatever Tolls are levied must be strictly applied to the repair and construction of Bridges and Roads in the vicinity. And though it is of course a very desirable thing to give to the community the convenience of such public works without the drawback of a Tax, and especially of a Tax so levied, yet as there is little prospect of our being able to assign from the general Revenues of Government, a sum at all approaching the demands of the Country for public works of the kind, the collection of Tolls cannot be disallowed on any such general objection. In each case, the benefit to accrue must be weighed against the probable burthen and annoyance; and as the pecuniary demand must in each individual case be light, so our arrangements should be so framed, as to avoid every occasion of unnecessary vexation.

4. It remains only to state, that His Lordship in Council will be happy to receive from the Committee any specific suggestions, which it may appear to them useful to submit to Government, with a draft of any rules that may be necessary to give effect to them.

5. His Lordship in Council sees no reason to think that Government has been put to any unnecessary expense by Captain Schaleh in the construction of the New Bridge at Kidderpore, and the necessity of that work is such, that there could have been no hesitation in undertaking it, even had a larger Disbursement been necessary.

6. The expense incurred will accordingly be sanctioned. But His Lordship in Council cannot refrain from observing, that the causes to which the excess of expense is to be attributed, though beyond control, appear to be such as with reference especially to the attempts adverted to by Captain Schaleh, might have been foreseen: and Estimates which admit of such extraordinary differences, are of course worse than useless. His Lordship in Council trusts, however, that with the experience Captain Schaleh has now had, no similar errors are hereafter likely to occur: and he relies with confidence on the care of your Committee to check any into which the laudable order of a Projector is always more or less likely to betray him.

7. It appears to be highly expedient, as suggested by the Committee, that wherever Suspension Bridges are erected, the District Barrack-masters should furnish the Superinten-

dent with an Annual Report. The necessary orders for giving effect to this suggestion, will be issued from the Military Department.

8. The Survey of the Proposed Line of the Diamond Harbour Canal appears to have been executed by Captain Taylor, in a very satisfactory manner ; and His Lordship in Council sees no reason to think, that the benefits of that work, or the facilities of executing it, have been overrated. But since at present neither the services of Captain Schalch, nor those of Captain Baker are available for the work, it appears, independently of financial considerations, to be expedient to postpone it.

9. For several reasons, His Lordship in Council prefers keeping the work in the hands of Government, and any Private Society would doubtless labour under much disadvantage if denied the services of Captains Schalch and Baker, which cannot be devoted to the work at the present moment.

10. The expense incurred by Captain Schalch in excavating the Ballaghaut Canal, and the construction of a temporary Bridge at Kooleeah, is sanctioned. *

11. The early completion of that part of the Eastern Canal which runs through the Salt Water Lake, appears to be an object of very considerable importance, even though the rest of the work should be suspended. His Lordship in Council concurs, however, with the Committee in thinking it advisable, if practicable, to carry on the General Plan, though on a modified system of operations. But His Lordship in Council regrets, that it is impossible at the present moment to spare the services of Lieutenant Prinsep, for the purpose, and Captain Schalch's attention must, it is apprehended, be for a time at least exclusively directed to the duties which he has to discharge under the orders of His Excellency the Commander-in-Chief.

12. Unless, therefore, the Committee shall be able to find a substitute for Lieutenant Prinsep, among persons not in the Service, His Lordship in Council apprehends that the scale of operations in the ensuing year must be restricted within still narrower limits than they contemplate. On this subject, His Lordship in Council is desirous of receiving a further report from the Committee in regard to the course they may consider it best to follow under present circumstances.

13. The purchase of Land in the vicinity of the Circular Road, appears to have been effected on highly advantageous terms ; and Government is greatly indebted to the Committee, for what has been accomplished in this branch of the scheme. It appears to be clearly expedient to go on with the purchases as the Committee propose, and His Lordship in Council authorizes the Committee to retain Mr. Turner, and a Native Ameen, for the purpose of completing the Surveys and Plans of the premises to be purchased.

14. His Lordship in Council unites with the Committee in regretting the circumstances which have rendered necessary so frequent an alteration in the disposal of the Officers employed under them. But the evil is one which it appears to be almost impossible to avoid, so long as the country shall be without any considerable body of men devoted exclusively to the profession of Civil Engineers. While Government has to select from the Army the persons to be employed in the executive Superintendence of Public Works, it must happen, that the occurrence of war will occasion an inconvenient interruption to their progress : and especially, when the war has to be conducted on [in] an entirely new Country, and under circumstances requiring a more than ordinary combination of means.

15. Should the Committee be able to point out any persons not belonging to the Service competent to conduct the works in question, according to the Plans of Captain Schalch, and subject to such general instructions as that officer may be able to give, His Lordship in Council will be fully prepared to consider any arrangements they may suggest, with a view to the uninterrupted prosecution of them. The Committee justly attach much weight to the regular and early preparation of Accounts. The adjustment of Accounts is

always troublesome in proportion to the delay which occurs in the settlement of them, and it appears therefore to be very desirable, that all Officers acting under the Committee, should furnish their Accounts monthly.

16. The Committee have very properly brought to notice the probable excess in the charge to be incurred on account of fixed Establishments, beyond the sum originally estimated. The difference, however, is not such as to lead His Lordship in Council to doubt the expediency of the undertaking, though in discussing the point, Captain Schalch appears to have assumed much too broadly, that experience has proved the impossibility of keeping open the direct communications between the Hoogly and the Ganges. The experiments made, have been on far too confined a scale to warrant any conclusion either way. But as far as they go, the results appear to favor the expectation, that the great object of keeping open one at least of the Channels in question may yet be attained.

17. The Committee will of course continue to use every practicable means of confining the expense of the Works in question, within the narrowest limits compatible with their efficient execution.

18. The Plans and Surveys are herewith returned, as requested by you.

I am, &c.

(Signed) HOLT MACKENZIE,
Secretary to Government.

No. 33. c.

CHARLES PATON, ESQ.

Officiating Secretary to the Canal Committee.

SIR,

I have to acknowledge the receipt of your letter, No. 34, dated the 25th ultimo, and request you will have the goodness to acquaint the Canal Committee, that in pursuance of their instructions contained therein, I lost not a moment in applying to Messrs. Clarke and Anley, Executors of the Will of the late Major J. A. Schalch, for all Papers, Documents, Maps, Plans, &c. relating to, or connected with the Canal and Iron Bridge Departments, which might be found amongst his (Major Schalch's) Papers. These gentlemen made no difficulty in complying with my requisition, but some delay necessarily occurred in examining and separating the Canal and Bridge Documents from a mass of Papers, not coming within the specification of your letter.

2. I have now the honour to forward, in compliance with the directions of the Canal Committee, two Lists (marked No. 1 and 2,) one of the Maps, Plans, &c., and the other of the Papers and Documents received by me from Mr. W. Anley, one of the Executors of Major Schalch's Will.

3. Besides the Maps detailed in the first List, the Plans, &c. stated in the margin,* were found among Major Schalch's Papers, but as they were marked "Private" in his own hand-writing, and did not appear to be directly connected with the works under the Superintendence of the Committee, I refrained from asserting any claim on public grounds, but consider them of sufficient value and importance to Report their existence for the information of the Committee, particularly the Plan for the proposed Harbour, which it might be desirable to possess in the event of future discussion on that subject.

* Plan illustrative of the Proposed Harbour for Shipping at the Port of Calcutta.

Plan of a Machine for Cutting Piles under Water.

Plan of a Machine for Driving Piles.

4. Many of the Maps and Plans are Duplicates or Office Copies of those already before the Committee. Some are rough Protractions of Surveys, and apparently of little value, I have not therefore arranged or classed them very minutely, and wait the further instructions of the Committee regarding them.

5. Of the Papers and Documents contained in the second List, many are the rough drafts of letters, which have probably been copied into a letter book; many consist of drafts and copies of Memoirs and Reports of little importance; but what I would draw the attention of the Committee more particularly to, is the correspondence, in the form of familiar private notes and letters, relating it is true to the Canal and Bridge Works, but certainly never intended by the writers to be retained as Records in a Public Office.

6. I also forward a List marked No. 3, of one bound, and seven stitched books, which are the Private Journals of Major Schalch, and of course not claimable as public property; but Mr. Anley entrusted them to me for examination, in order to ascertain, if they afforded any information likely to be useful to Government. I have not had time to read them with the attention they demand, but as far as I can form an opinion, from a cursory perusal of them, I think them valuable. They relate almost entirely to the works in contemplation at the time they were kept, and appear to contain, not only Major Schalch's first conceptions of the Plans he subsequently matured, but of many others, some of which may possibly be adopted hereafter, together with much local information on various subjects relating to the Eastern Canal. They serve to develop the ideas of that able Engineer on the works he was entrusted with the construction of, and would enable his successor more effectually to follow up and execute his Plans now, or lately in operation.

I am, &c.

CALCUTTA,
11th April, 1825.

(Signed) * J. W. TAYLOR,
Assistant Superintendent of Canals.

* Query T. M.
Taylor--J. M.

No. 33. c.⁽¹⁾

No. 1.

List of Maps, Plans or Sketches, relating to, or connected with the Canal and Iron Bridge Department, received by Captain TAYLOR, Assistant Superintendent of Canals, in pursuance of instructions from the Canal Committee, from W. ANLEY, Esq. one of the Executors of the Will of the late Major J. A. SCHALCH, Superintendent of Canals, Calcutta, April 6th, 1825.

Survey of Tolly's Nullah, &c. from its mouth to Kamapookereah.

Section for Floating Gates and a Dock, by Mr. Holcroft, from a Plan by Reunie.

Map with Sections, explanatory of a Plan for improving the Navigation between the Lower parts of the River Hoogly and Calcutta.

Original copy of Captain Taylor's Map of the country between Calcutta and Channel Creek, and one unfinished copy of the same.

Sketch of the Diamond Harbour Creek, by Mr. Chalk.

Map of the communication between Diamond Harbour and Calcutta.

A Survey of Tolly's Nullah, in two parts.

Captain Taylor's Survey of the mouth of Tolly's Nullah, and a copy of it.

Diamond Harbour
Canal.

- Diamond Harbour Canal. Line of the Road to Diamond Harbour, (a penciled Sketch,) and the country between it and Kamapookereah.
 Section, shewing the rise of the Tides in the Hoogly.
 A Reduced Map, explanatory of a Plan for improving the Navigation between the Lower parts of the River Hoogly and Calcutta.
 Protraction in Pencil of the Road from Rajahaut to Culpee.
 Diamond Harbour Canal, with a Plan for a Lock Gate.
 Unfinished Map, explanatory of a Plan for improving the Navigation between the Lower parts of the River Hoogly and Calcutta.
 A ditto ditto, finished.
 Levelling Section and Route between the Diamond Harbour Road and Kamapookereah.
 Levels at Diamond Harbour, and the Plan of a Lock Gate.
 A Survey of Tolly's Nullah.
 Map of a communication between Diamond Harbour and Calcutta.
 A Reduced Map, shewing the Line of the proposed Canals of communication between the Hoogly and Calcutta, and a Levelling Section between the Diamond Harbour Road and Calcutta.
- Eastern Canal. A Map of the proposed New Navigation from Koolna to Calcutta, the Plan of the Canals, and the present passage through the Sunderbuns, four engraved Maps.
 Rough Protraction of the *Pupae* River, in pencil.
 Three Sketches of parts of the Sunderbuns.
 Rough Protraction of the Cobulmunee Nullah, in pencil.
 Two Sketches of the Road to Diamond Harbour, and one shewing the difference of Level between the Parade there, and the Surface of the Salt Lake.
 Rough Protraction of the Banginkhal, in pencil.
 Section shewing the difference of Level of the Salt Lake, and four unfinished Sketches relating to the Eastern Canal.
 Map of the Eastern Canal.
 A Map of the City of Calcutta, with part of the Suburbs and adjacent Country lying to the Eastward, shewing the direction of the proposed Canal of communication with the Hoogly River and the New Passage as far as Tardah.
 Four unfinished Sketches of the Sunderbuns.
 Map of the New Canal through the Sunderbuns.
 Section, shewing the difference of Level in the Dry and Wet Seasons of the Salt Lake.
 A Map of such parts of the Rivers Gurray, Komae, Burassee and Moodoomuttee, as form the Navigation between the Ganges and the Sunderbun Passage, together with the Utaree Banka and Mowdew Nullahs.
 Four Sketches of the Levels of the Salt Water Lake and the Calcutta Road.
 Five rough Sketches relating to the Eastern Canal.
 Rough Map of the Eastern Canal.
 A Map of the Suburbs and Country S. E. of Calcutta, shewing the direction of the proposed Canal communicating with the Hoogly and Ganges.
 The Delta of the Ganges and course of the Eastern Canal, on one sheet.
 Morrison's Survey and Line of the Canals through the Sunderbuns.
 Rough Protractions and Plans of the Ganges between Koolna and Rajemahl.
 Map of the Country between Coolna and Calcutta.
 Levelling Section between Dum-Dum and the Salt Lake.
- Cuttack Canals. Two Sketches of the country between the Gummy and Montay Nullahs, shewing the direction of a Canal to join these streams.
 Rough Map of the Chouramoonee Canal.

Sections of the Goreekhal and Kuddunkundee Bridges.

Ground Plan of Kallyghaut Bridge.

An unfinished Sketch of a Bridge.

Bridges.

Elevation of an experimental Iron Bridge, erected over Tolly's Nullah at Kallyghaut.

Unfinished Elevation of an Iron Suspension Bridge, believed to be one of those made for Cuttack.

Plan and Elevation of the Kooleah Bridge.

Section of the Julka and Goreekhals, by Captain Stephen.

Elevation of an Iron Suspension Bridge, proposed to replace the present decayed Bridge at Kidderpore.

Unfinished ditto ditto ditto.

Five Plans and Sketches, relating to the New Kidderpore Bridge.

Rough Plan of a Bridge for the Cuttack Road.

Rough Plan of a Pier for the Kidderpore Bridge.

Survey of the Route from Calcutta to Juggurnauth.

A Plan of the Kidderpore Bridge.

Elevation of the entrance to the Kallyghaut Bridge.

Plan and Section of the Kanae Nullah, near Sehora.

Various rough Plans and Sketches for Dredging Boat Machinery.

Miscellaneous.

(Signed) T. M. TAYLOR,
Assistant Superintendent of Canals.

No. 33. c.⁽²⁾

No. 2.

List of Documents and Papers, relating to, or connected with the Canal and Iron Bridge Departments, received by Captain TAYLOR, Assistant Superintendent of Canals, in pursuance of instructions from the Canal Committee, from W. ANLEY, Esq. one of the Executors of the Will of the late Major J. A. SCHULCH, Superintendent of Canals, Calcutta, April 6th, 1825.

Rough Estimate of the expense and rate of Digging Canals.

Diamond Harbour Canal

Note to Mr. Mackenzie, and his Reply relating to the Salary of an Assistant.

Seven Notes and Letters from Captain Taylor, relating to the Surveys and Levels for the Diamond Harbour Canal.

Note from Mr. Kyd, relating to the rise of the Tides.

Copy of a Letter to H. Shakespear, Esq., on the Proposal and Plan of a Canal to Diamond Harbour.

Original Draft of the Memoir on the Eastern Canal, with various copies and parts of copies of the same, the whole consisting of 55 sheets of foolscap paper, 3½ of letter paper, and a stitched book.

Eastern Canal.

Report of Lieut. Prinsep, on the Salt Kolareis.

Questions put to Lieut. Prinsep, and his Replies.

Rates of Digging per Chowkah, and List of the Hauths near the line of the Canal, (a Memoir.)

Eastern Canal. Two Notes from Lieutenant Henderson, relating to Tents, and a List of Pergunnahs.
 Native Petition to Mr. Barwell, from the Salt-makers.
 Translation of the above.
 Application of Serjeant Whitehead, urging certain claims on the Government.
 Original Memoir, relating to the opening of the Eastern Canal, and the effects likely to result from a communication between the Hoogly and the Salt Lake.
 A Letter to Mr. Kyd, relating to the Eastern Canal.
 Paper relating to the construction of the Eastern Canal and Establishment necessary for that purpose.
 Two Memorandums on China Paper of Contingent Charges and Outstanding Balances on the Eastern Canal.
 Twenty-one Notes and Letters from Lieutenant Prinsep, Assistant Superintendent of Canals, relating to the works conducting by him; Reports of Progress, &c.

Iron Bridge Department. Letter from Captain Broughton, relating to the Cuttack Bridges.
 Copy of a Letter to Captain Craigie, Secretary to the Military Board, in Reply to a requisition for Copies of Plans of Bridges, &c.
 A Note relating to the price of Timber.
 Ditto from Captain Garden, relating to the Iron Bridge Accounts.
 Ditto from Mr. Swinton, relating to a Pattern Bridge for the Bombay Presidency.
 Memorandum of the Weight of the Cuttack Bridges.
 Letter from Captain Playfair, on the Caramnassa Bridge.
 Private Note from Mr. A. Colvin, relating to a supply of Stones from Allahabad.
 Memorandum on China Paper of Receipts and Disbursements in the Bridge Department.
 Memorandum three sheets, on the construction of the Kallyghaut Bridge.
 Two Letters addressed to T. Prinsep, Esq. Officiating Secretary to Government, relating to the Kallyghaut Bridge.
 Letter to H. Mackenzie, Esq., on the Cuttack Bridge.
 Copy of Letters from C. Barwell, Esq. to Mr. H. Mackenzie, relating to the employment of Convicts on the Kallyghaut Bridge.
 To H. Lushington, Esq., relating to an Indent for Smith's Tools.

Cuttack Bridges & Canal marked "Capt. Stephen's Papers." From H. Mackenzie, Esq. to Captain Stephen, enclosing an extract from the Report of a Committee of Survey on the Juggernath Road, &c.
 Letter to Mr. Mackenzie in Reply.
 Ditto from Mr. Mackenzie, relating to the erection of Iron Bridges of Suspension.
 Two Letters to Mr. H. Mackenzie, and his Replies to them.

Four Notes, being a Correspondence with Captain Cumberledge of the Ship *Ganges*, relating to an Hydrostatic Proving Machine, and a supply of Iron and Coals.

Steam Engine and Dredging Boat. Four Letters to Mr. H. Mackenzie, on the purchase of a Steam Engine, and construction of a Dredging Boat.
 To Mr. Kyd, relating to the building of a Dredging Boat.
 Note to Mr. Mackillop, relating to the purchase of a Steam Engine.
 To. J. Barwell, Esq. Tub-treasurer, with bills for the payment of the price of a Steam Engine.

Seven Sheets stitched together, containing Correspondence, Plan, Estimate, and Report on the
Proposed Canal at Chooramoonce. Chooramoonce on
Cuttack Canal.

Letter from Mr. Blunt, to Captain Schaleh, relating to the advantages of a Canal at Chooramoonce.

Letter to Mr. H. Mackenzie, on the state of Tolly's Nullah.

Tolly's Nullah.

Letter to C. Trower, Esq., applying for an advance of Cash to clear Tolly's Nullah.

A file of Papers, English and Native, being Agreements and Securities with certain persons,
furnishing Coolies and Workmen.

(Signed) T. M. TAYLOR,
Assistant Superintendent of Canals

No. 33. c.⁽³⁾

No. 3.

List of the late Major SCHALEH's Private Journals.

- No. 1. Private Journal of a Voyage through the Sunderbuns, for the purpose of ascertaining a more commodious and direct Navigation between Calcutta and the Great River than that at present made use of, commenced October 30th, 1820.
 - No. 2. Ditto ditto ditto, from the 11th to the 30th of November, 1820.
 - No. 3. Ditto ditto ditto, from the 30th November to 28th January 1821, and a Journal of a Voyage from Calcutta to Rajemahl and Commercolly.
 - No. 4. Ditto ditto ditto, continued, and return to Calcutta through the Sunderbuns.
 - No. 5. Journal of a Voyage with Mr. Gordon, from Calcutta to Rajemahl, and a Journal of a Trip to Diamond Harbour and Channel Creek.
 - No. 6. From Calcutta to Balasore, December 21st, 1822, to examine the Goreekhal and Kuddunkundee Nullahs; and to Chooramoonce, to examine the ground through which a Canal was proposed to be carried by Mr. Schultz.
 - No. 7. From Chooramoonce to Juggernaut and Cuttack, January 3rd, 1822.
- A bound Book, into which a considerable part of the above Journals have been copied.

CALCUTTA,
11th April, 1825.

(Signed) T. M. TAYLOR,
Assistant Superintendent of Canals.

No. 33. e.

To CHARLES PATON, ESQ.

Officiating Secretary to the Canal Committee.

SIR,

I have to acknowledge the receipt of your Letter, No. 44, under date the 22nd instant.

2. In reply to that part of it which conveys the directions of the Canal Committee that I should forward "Lists of all the Private Papers and Documents belonging to the Estate of the late Major Schalch, which I conceive likely to prove useful," I conclude, those only are meant which are in some manner immediately or remotely connected with the Canal or Iron Bridge Works, and therefore, beg leave to refer you to the marginal list of the 3rd Par. of my Letter of the 11th instant, and to the List marked No. 3, alluded to in the 6th Par. of the same letter, which comprise the Lists required.

3rd. Of those enumerated in the first, I do not consider any thing of importance, except the Plan for the proposed Harbour for Shipping.

4. With respect to the Letter I now forward, a List more descriptive of the late Major Schalch's Journals than that which accompanied my last letter, and which I trust is sufficiently so to enable the Committee to form a clear idea of the nature of their contents, I do not, however, attach the importance to them which your Letter appears to imply, but I conceive they would prove extremely useful to whoever may be appointed to carry on the works, planned and commenced by the late Major Schalch.

5. I feel considerable reluctance in attempting to estimate what might be considered a fair remuneration to the Estate of the late Major Schalch, for the possession of these Papers, as the habits of intimacy which existed between us, might operate to render me liable to do more than justice to his heirs. The Committee will therefore receive my opinion with advertence to this circumstance, but perhaps concur with me in thinking, that something may be conceded to the Memory of the late Superintendent's services and talents; with this view of the case, perhaps 400 Rupees might not be considered an unreasonable remuneration to the Estate for the Property of these Papers.

6. I request you will acquaint the Committee, that in compliance with their instruction, I have delivered to Captain Baker, all Papers and Documents relating to the Bridge Department, and I have the honour to forward his receipted List of the same.

7. I request you will do me the favour to solicit the attention of the Committee to the 5th Par. of my Letter of the 11th instant, and I trust they will pardon the liberty I take in suggesting to them, the propriety of returning the Private Notes and Letters alluded to therein, to the writers of them.

I am &c.

(Signed) J. M. TAYLOR, *Captain,*
Assistant Superintendent of Canals.

CALCUTTA,
28th April, 1825.

No. 33. *e.*⁽¹⁾*List of the Private Journals of the late Major J. A. SCHALCH.*

Nos. 1, 2, and part of 3 contain the Diary of a Voyage through the Sunderbuns, commenced on the 30th of October, and ending the 7th of December 1820. It was made professedly "For the purpose of ascertaining a more commodious and direct Navigation between Calcutta and the Great River than at present made use of," and comprised a careful examination, and partly the Field Book of a Survey of the different Rivers and Creeks between Calcutta and Koolna, with Observations on the rise, fall, and set of the Tides; various Sections of different Creeks; the nature of the country, soil, expense of clearing the Jūngle; the present mode of Navigation and its disadvantages; and Examination of the Salt Water Lake.

The remainder of No. 3 and all No. 4, is the Journal of a Voyage up the Hoogly to Rajemahl, and back to Calcutta via Comercolly and the Sunderbuns, commenced 21st of December 1820, and ending the 8th of February 1821. It contains various remarks on the state of the River Hoogly and Ganges, between Rajemahl and Koolna, and the Rivers communicating with them, as the Jellinghy and Mattabangah; a Survey of the Gurroy and other Rivers; and generally, similar Observations and Remarks to those of Nos. 1, 2, and 3, as detailed above.

No. 5 contains, 1st. Journal of a Trip in company with Mr. Gordon, to Rajemahl in November 1821; 2ndly, an Examination and Survey of the Diamond Harbour Road to Rajahaut, and thence to Culpee; 3rdly, an Examination of Tolly's Nullah and the Puttoory Creek; and 4thly, a Trip to Diamond Harbour and Channel Creek, including an Examination of the Creek communicating with the latter and the New Anchorage. These, with the exception to the first, relate directly to the Plan for the proposed Canal, communicating with Diamond Harbour and Channel Creek.

Nos. 6 and 7 contain the Journal of a Trip to Balasore and Cuttack, and relates to the Canals and Bridges proposed to be constructed in that District.

The Bound Book contains a fair Copy of a considerable part of the above-mentioned Journals, but is not completed or corrected.

CALCUTTA,
28th April, 1825.

(Signed) T. M. TAYLOR,
Assistant Superintendent of Canals.

No. 35.

No. 109.

To LIEUT. PRINSEP,

Engineer.

SIR,

I am directed by the Canal Committee to request, you will favor them with your opinion on the following points, relating to the Canals carried on under your immediate Superintendence in the neighbourhood of Hoosenabad:—

1st. If these Canals would prove advantageous when completed, independently of the General Scheme for improving the Navigation between the Rivers Ganges and Hoogly.

2ndly. What local advantages are likely to accrue from completing them?

APP. II.

M

3rdly. If the completion of them would afford data to form a judgment of the practicality or difficulties to be anticipated in the execution of Major Schaleh's Plan generally, by shewing the action of the Tides in them in forming deposits, or in acting upon their sides.

4thly. At what expense the Cuts might be completed?

On these points the Committee flatter themselves with the hope of receiving the most satisfactory information from you, being well aware of the opportunities you had on the spot of acquiring the fullest and most authentic information from the best sources.

I am, &c.

CANAL COMMITTEE'S OFFICE,

CALCUTTA.

3rd November, 1825.

(Signed) T. M. TAYLOR,

Officiating Secretary, Canal Committee.

No. 36.

No. 111.

TO THE PRESIDENT AND MEMBERS OF THE EMBANKMENT COMMITTEE OF THE 24-PERGUNNAHS.

GENTLEMEN,

Under instructions from Government in the Territorial Department, dated the 6th instant, I am directed by the Canal Committee to submit the following subject connected with the Proposed Plan for improving the Navigation between the Rivers Hooghly and Ganges, for your consideration and opinions.

1st. If the Cuts, commenced by Major J. A. Schaleh, late Superintendent of Canals, &c. would (if completed) be useful independently of the General Scheme for improving the Navigation of the Sunderbuns. The first of these Cuts connects the Jabuna or Esamutty River and the Dansarkhal, commencing at a point on the former about 4 miles South of Bagundee near Hoosenabad, and running in a Westerly direction about seven furlongs. The second is to connect the Chanpoorkhal, or Kyontullah, Doamya and the Gobrahal, commencing on the former immediately opposite to the mouth of the Dansarkhal, and running in a South-west direction 1 mile and 2 furlongs.

2ndly. The expense at which these Cuts could be completed should the measure be deemed advisable, and

3rdly. If the work might not be executed under the Superintendence of the Officers in charge of the Embankments in the 24-Pergunnahs; or what other temporary arrangement might be adopted to effect the object in view with most advantage.

To elucidate the subject proposed for consideration, I have the honor to forward a Sketch, shewing the General Plan of the Canals through the Sunderbuns, and also a Plan with Sections of those which have been partially executed. They will assist you in forming an opinion on the advantages to be derived from the Cuts, and what yet remains to be done to complete them.

It is requested that the Sketch and Plans be returned to this Office.

CANAL COMMITTEE'S OFFICE,

CALCUTTA,

11th November, 1825.

I am, &c.

(Signed) T. M. TAYLOR,

Officiating Secretary, Canal Committee.

No. 37.

No. 120.

To CAPTAIN TAYLOR,

Secretary to the Canal Committee, Calcutta.

SIR,

I have to acknowledge the receipt of your Letter, No. 109, of the 4th instant, and shall be most happy in furnishing every information in my power relating to the Canals, in the success of which I have naturally imbibed a lively interest.

2. The Committee must be aware, that upon a subject involving so many intricate points, a prompt answer would be unsatisfactory. I have to request the favor of some delay to allow of a more mature consideration of the subject, and to allow a reference to Plans, and Documents relating to the subject, none of which are at present with me at my Station of Chittagong.

3. The Committee would likewise confer a favor upon me, by transmitting a few Documents and Surveys [some my own] of which I have not kept Copies. A List shall be forwarded of those that appear most essential, and the Documents returned to the Office. I have likewise to suggest the advantage that would accrue by my personally visiting the seat of former operations at Hosseinabad, to ascertain the present state of the work left unfinished after the season, May 1824. Several circumstances may be elicited in observing the action of the Tides in the unfinished Cuts, which would greatly influence any opinion upon the success of the Canals. The Committee will, I trust, at once see the necessity of the visit, and with their concurrence, I will, when the opportunity occurs of there being no pressing business upon my hands, as Executive Engineer of a District, obtain the necessary leave for a month to perform the duty.

4. I have further to request to be informed with regard to the questions forwarded in your Letter, whether any other than the two Cuts, to which the operations were limited in 1823-24, may be considered as included, or whether the whole Cuts between Hosseinabad and the Salt Lake are intended. The junction of the Lake with the Hoogly at Chitpore, from which Major Schalch expected that the principal advantages were to accrue in the re-sale of the Land, &c., involves many questions of great nicety, and as I have not at any time been privy to the proceedings of the Committee in purchasing the ground, and am not aware that any very accurate Survey of the ground has been made, I could not immediately speak to the detail of that most important part of the Scheme.

5. The Committee are, I conclude, aware from previous correspondence, that many parts of the Line East of the Esamuttee River, are still very imperfectly Surveyed, and that the General Scheme of the Canal still requires much patient investigation, before any very accurate estimate can be formed of the real expense, or a very particular idea formed of the several minutiae of the Scheme.

EXECUTIVE OFFICE,
CHITTAGONG,
13th November, 1825.

I have, &c.
(Signed) THOS. PRINSEP,
Ex. Engineer.

No. 37. a.

List of Documents to which I have to request to be allowed to refer.

My general Survey of the Line from Hoseinabad to the Beharee Nullah.

My Sketch of the Salt Lake and Environs.

The late Major Schaleh's detailed Estimates, of which I have never obtained a Copy.

An abstract account of the Expenditure upon the Hoseinabad Canal in 1823-24.

TO CAPTAIN TAYLOR, *5th Cavalry,*

Officiating Secretary, Canal Committee's Office, Fort William.

No. 38.

CAPTAIN T. M. TAYLOR,

Secretary, Canal Committee.

SIR,

In compliance with the wish of your Committee, communicated to us on the 8th July last, we have now the pleasure to submit an Estimate, shewing the expense of a single Rail Road, including Engine, Waggon, &c. from the Circular Road to the Balliaghaut.

As this Estimate exhibits also the cost per mile on a strait line, the probable expense to Diamond Harbour may easily be calculated when the distance is known.*

We have likewise the pleasure of furnishing herewith a Plan, which will give an idea of the Rails, Waggon, &c. and the manner of laying down.

We take the liberty to enclose a Report and Estimate which were laid before a Committee in England; in it you will find fully enumerated all the advantages which this mode of conveyance possesses over every other; it is therefore unnecessary for us to repeat them.

We have to apologise to the Committee, that so much time has been permitted to elapse since the order was received, but the very unsettled state of the weather, added to several other circumstances, prevented us from commencing on the measurement of the Board, and we trust the delay will not be imputed to negligence.

We are, &c.

CLIVE STREET,

(Signed) JESSOP AND Co.

11th November, 1825.

* About 25 miles from Kidderpore Bridge to the Godowns.

(Signed) T. M. T.

No. 38. a.

Each Railway being 3 feet long and 5 lbs. weight, and 2 ways being required to each yard, one mile in length, will weigh about, 88 Tons.

88
22 £ per Ton.
£ 1,936 for Railways in 1 mile.
250 Nails.
2,186

For the Diamond Harbour	Exchange at 2/1 per Rupee,	21,860
Road the Estimate will be	Blocks, Piles, &c.	30,000
57,860X264, Sa. Rs. 15,23,290	Common forming, &c.	6,000
Turnings and Wharfings, .. 55,000		
Locomotive Engines, 24,000		
30 Waggons, 18,000		
	Each mile of Railway fitted,	57,860
16,20,290		
Contingencies at 20 per cent. 3,21,058		
Sicca Rupees 19,41,348		
	The distance from the Circular Road to the Salt	
Without reference to the expense of	Water Lakes is 2.55 miles, Rs. 57,860X2.55, 1,47,543	
New Bridges.	Ten-horse Locomotive Engine,	12,000
(Signed) T. M. TAYLOR.	15 Waggons, 3 to 4 Tons each, at 600,	9,000
Turnings, Wharfings, &c.		55,000
		2,23,543
Contingencies at 20/ per 0/0		44,709
		2,68,252

Signed) JESSOP AND CO.

No. 39.

(No. 113.)

To H. MACKENZIE, ESQ.

Secretary to Government in the Territorial Department.

SIR,

Pursuant to the instructions contained in your Letter, No. 609, of the 30th of June last, I have the honour to forward, by order of the Canal Committee, a Copy of a letter which has been received from Messrs. Jessop and Co., with the Plan and Estimate of the expense of a Railway from the Circular Road to Ballia Ghaut, amounting to Sicca Rupees 2,63,252, and also the expense of a Railway for one mile, by which that to Diamond Harbour may be ascertained.

As the distance from the Kidderpore Bridge to Diamond Harbour by the Road is about $26\frac{1}{2}$ miles, the expense of a Railway, according to Messrs. Jessop and Co.'s Estimate, and including that of 2 Engines and 30 Waggon, together with Contingencies, will amount to about 19,44,348 Rupees.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
16th November, 1825.

I am &c.
(Signed) T. M. TAYLOR,
Officiating Secretary, Canal Committee.

No. 40.

To LIEUTENANT TAYLOR,

Acting Secretary to Canal Committee, Calcutta.

SIR,

We have the honor to acknowledge the receipt of your Letter, under date the 4th instant, requiring us to state our opinion, whether certain Cuts commenced by the late Superintendent of Canals would, if completed, prove useful independently of the general schemes for improving the Navigation of the Sunderbuns, and whether the work might not be advantageously executed under the Superintendence of our Committee.

2d. On the first of these points, we beg leave to express our opinion, that no advantage whatever would be gained by connecting the Juboona River with the Dansarkhal, and the Kyontullah Doonya with the Gobra Khal independent of any other Cuts, on the following grounds:—That Boats before they could enter the Cuts in question from Calcutta would still have to pass through the Attarah Banka, which it was one great object of Mr. Schalch's Plan to avoid, and because, after quitting the Attarah Banka to reach the New Canals, they would still have to pass through as much Jungle as they would encounter were they to proceed to the Juboona by the usual route; while, to Boats, which have afterwards to pass through Goodlad Creek to the Eastward, the distance by the former route would be considerably greater than by the latter. The New Cuts might perhaps obviate the delay to which Boats are at some seasons subjected by adverse winds at the junction

of the Roymungul and Burra Coolea ; but as this delay is seldom expected till it has been actually experienced, it is doubtful whether Boats would often choose what is apparently the more tedious route, for one which may only become so by adventitious circumstances.

3d. On the second point, we have to remark, that the distance between the station of Jessore and the New Cuts is not less than fifty miles, while from Calcutta it is considerably less, and that the collections of the revenue from the adjoining Lands is made by the Commissioner in the Sunderbuns, while the administration of justice is in the hands of the Judge of the Twenty-four Pergunnahs and the Joint Magistrate at Barraset. On these grounds, we conceive, supposing Government should resolve upon executing the work, that it could not be advantageously Superintended by our Committee, and in the event of a separate Officer not being appointed for that special duty, that it could not be Superintended so efficiently as by a Committee resident in Calcutta.

4th. The Plans, which accompanied your Letter, are herewith returned.

We are, &c.

ZILLAH JESSORE,
COMMITTEE OF EMBANKMENTS,
The 28th November, 1825.

(Signed) R. W. MAXWELL,
Acting 2nd Member
,, D. DALE,
Acting Member.

No. 42.

To CAPTAIN T. M. TAYLOR,

Officiating Secretary to Canal Committee.

SIR,

We have the honor to acknowledge the receipt of your Letter, dated the 4th instant.

2. As we are not informed of the particular objects of the Excavations proposed to be made between the Esamotee and Dhansar Khall and the Chundpoor and Gobra Khall, we feel ourselves incompetent to judge of the usefulness of the work, but as the measure was proposed by the late Major Schalch, and the work with the sanction of Government actually commenced by him, we are naturally led to suppose, that so able an Officer as Major Schalch could not have recommended, or the Government have sanctioned, the measure unless convinced and satisfied of its utility.

3. On the 2d point referred to our notice, we beg to state, that we have no experience to guide us in forming even an Estimate of the probable expenses of the undertaking, and therefore feel diffident in offering any opinion on the subject.

4. On the last point of reference, we have to inform you, that the places at which the Canals are proposed to be excavated, are not situated on the District in which our authority as a Committee of Embankments extends, and that if they were included in it, we are of opinion the present duties of the Superintendent would not allow of his giving his time and attention to so extensive an undertaking.

5. The Plan and Sketch are herewith returned.

We have, &c.

BARRIFORE
EMBANKMENT COMMITTEE,
24-PERGUNNAHS,
The 16th November, 1825.

(Signed) T. PLOWDEN,
Acting Collector.
,, R. H. SCOTT,
Judge and Acting Magistrate.

No. 43.

SIR,

Your Letter No. 115, with its enclosures, has been received, and I proceed to the several questions of your former Letter, No. 109, upon which I can the more readily enter after your explanation in the last paragraph.

2. Both the Cuts are, I expect, fully accessible to the Tide, although unknown to the Committee, as inferred from your Paragraph 3d. The opening at C. 1 Cut, or the Hoseinabad Canal, was effected by Major Schalch, before leaving the spot in May 1824, and I have little doubt, that the Tide has opened already more than one entrance into No. 2 Cut, or Bayley Gunge Canal.

3. Before entering upon the questions direct, I have to submit a few preliminary observations.

4. The Cut No. 1, closed against the River at A, now brings the Salt Tide within 180 feet of the fresh water of the Eshamuttee River under circumstances, observations upon which would at once determine the practicability and advantage of admitting the Salt Tide into that River, and likewise suggest the method necessary to be adopted; such observations are highly desirable, and have not as yet been procured within my knowledge. The result of many of my own successive observations* from January to April 1824, created apprehensions to be entertained from the result of its admission, and in consequence, the measure of closing the head of the Western branch of the † Hoistullah Avanya [Kyontullah Doanya] below the origin of the 2nd, or Bayley Gunge Cut at X, (vide Plan No. 1,) formed a part of Major S.'s scheme, which was I believe communicated to the Committee.

5. The expense of this Bund will be considerable, from the large section of the water-course, and its position will detract a trifle from the advantages (in point of communication) to be derived from opening the two Cuts, without prosecuting the series to the Chowmook Khal and Salt Lake; inasmuch as it lengthens the course by $8\frac{1}{2}$ miles to the Gottyāhara Point, an entrance into the old Attara Banka passage.

6. Two rainy seasons have passed since operations were suspended upon the work, and much may have taken place greatly to the detriment of the undertaking, (in the falling of the banks, &c. of these Cuts) which has neither been attended to, nor reported.

7. The Committee will therefore fully understand my anxiety for a personal inspection of their present state.

8. I have further to remark, that the actual expense incurred upon the two Cuts will, I trust, greatly exceed what may be assumed, as a Standard for the rate of future operations under careful management. The experience gained (certainly at some loss) by the late operations in carrying the Canal through Jungle, at the same time that it establishes the perfect possibility of the undertaking, has suggested many points to be attended to in the economy of the execution of this part of the scheme. The operations upon No. 2 Cut were in every way unlucky. The late period at which the contracts were entered into, sickness, mortality, and general disgust at the nature of the work, created the evil desertion to such an extent, that the Contractors, who brought their Coolies from 20 to 40 miles inland, could not perform their engagements, save with the certainty of loss. Their subsequent chicanery at the time of closing the proceedings, was the result of their expectation of loss, and hence the large Balance outstanding against them. The same thing could not have happened, were operations limited to cultivated country, or if sufficient means

* Upon the relative advent of the Salt and Fresh Tides, and their levels (simultaneous) at different times.

† A term I believe peculiar to the Sunderbuns, meaning a Khal, divided into two branches of equal magnitude, and only applied as in this case, to the termination of the Salt Creeks, where they are met by cultivation.

were provided for the comfort of the Coolies, who must necessarily be strangers, as the Salt Districts yield few or no hands available in an extensive undertaking.*

I would therefore earnestly suggest that, if any future prosecution of the works is anticipated, the assistance of the Commissioner in the Sunderbuns should be solicited, and his attention called to the advantage that would accrue by cleaning and bringing under cultivation the particular tracts of Jungle through which the Canal has to pass.

10. I speak from personal experience, when I affirm, that many applicants would readily engage on the Jungle Potta terms, to settle on the spots in question; and I think the Commissioner will agree with me in anticipating its advantages to the Canal in point of saving, even should it be necessary to grant a bonus by way of remuneration to any successful clearer.

11. I now proceed to the several questions of your Letter No. 109, successively :—

Question 1st. Whether the Canals would prove advantageous when completed, independent of the general scheme for improving the Navigation between the Rivers Ganges and Hooglee?

Answer. Advantageous in point of any revenue to be derived, certainly not. The only preference they can offer to Morrieson's Cut and the Bura Koolya Passage [is] in the escape from the celebrated Roymungul corner, only dangerous during the S. W. monsoon to ill-found Boats. The advantage is purchased by lengthening the route, and I should fear that few Native Boats would consider their advantage worth even a trifling Toll. The Gottyahara Khal, by which they will still have to pass into the Attara Banka Passage, is one of considerable dimensions, and its course N. and S., exposed to the fury of the Monsoon. The danger is, however, less than at the Roymungul corner.

The series of Cuts, unless followed beyond the Chowmook to communicate with the *Tardu Nulla*, or Salt Lake, can offer no chance of being productive as a thoroughfare.

Again. It may become a necessary, and therefore advantageous, measure, to effect the opening of the Hoseinabad Cuts, in order to prevent their being rendered perfectly useless hereafter, from sediment left by the receding Tides in their bed, or by the falling in of their banks, which were Cut at too steep an angle (45°) to ensure permanency.

This point and the method to be adopted in effecting such opening, is only to be ascertained by a Survey of their present state.

Question 2nd. What local advantages are likely to accrue from completing them?

Answer. The previous observations will have apprized the Committee, that as apprehensions may naturally be entertained of even local disadvantage, it will be necessary to allay these by careful observation upon the subjects pointed out in Paragraph 4 of those remarks, from which data may be obtained to determine all doubt.

I consider the alarm raised among the Salt Manufacturers near Hoseinabad in consequence of Major S——'s determination to close the head of the Kulloor Gang, below the origin of the Bayley Gunge Canal, as groundless; and if this part of the scheme be carried into effect (Observation at A. of No. 1. Cut will determine whether it is indispensable,) the apprehension from the admission of the Salt Tide into the Eshamuttee will fade considerably, if not entirely disappear.

Some local advantage may be afforded to any, who may settle for purposes of cultivation in the vicinity of the Jungle line of the Canal, by the facilities offered by the mound of Exca-

* Some reasonable hope may even now be entertained of recovering some of these balances by pursuing the work, if the cases which were opened in the Courts produce nothing.

vation to clearing and bunding operations. The present disputed rights of property in the Jungle Land render, however, the chance of settlers availing themselves of these advantages uncertain.

Any other advantages to the prosperity of the neighbourhood will of course be limited, from the smallness in extent of the cultivated country immediately concerned.

The local advantages I should therefore say were not considerable, and of rather a general nature; all apprehension of disadvantage may, I think, easily be met by a little care and investigation.

Question 3rd. If the completion of these would afford data to form a judgment of the practicability, or difficulties to be anticipated in the execution of Major S——'s Plan generally, by shewing the action of the Tides in them, in forming deposits, or in acting upon their sides?

Answer. The completion of these Cuts, the management that observation may dictate, and the experience to be gained from their result when completed, will furnish data most indubitably for nearly every case likely to occur between the Salt Lake and Koolna, and must therefore be desirable.

With regard to the question in the more limited view, in which it may be taken literally, it is quite evident, that any Cut under the circumstances of No. 1, must become subject to corrosion of its banks during the Freshes of the River. The extent of such corrosion will no doubt be determined by the completion of the Cut.

Again, with regard to No. 2, in case the Bund at X should not become indispensable in opening No. 1 into the Eashamuttee, as the points A and B of No. 2. are equidistant from the bifurcation of the Keontulla Doanya, and therefore the advent of the Tide simultaneous, it is to be feared that the Tide will meet in the centre of the Bayley Gunge Canal, and, under the most unfavorable circumstances, as the Cholkoonee Sand Bank, (which we found it impracticable to pierce below the depth of 7 feet,) must become the point of collision. This care, or a modification of it, must be of most frequent occurrence in the series of Cuts. The bund at X, if made, will of course annul the objection, and may contribute still further to the advantage of the Canals by ensuring a set of Tide, which it is highly desirable should be uniform, even as far as the Baimaree Khal or Chowmook. It may likewise furnish the opportunity of diminishing the enormous expense required to empty and complete the Excavation of the 2d Cut,* by affording the possibility of introducing a current of water during the Freshes from the Eshamuttee.

The once apprehended impossibility of carrying a Canal through uncleared Soonderbun Jungle, under water every Flood Tide, has already been met by the late operations, and its perfect feasibility established. A point of still more consequence to the success of the undertaking will be placed beyond a doubt, if the junctions of the Salt and Fresh Tide at Hoseinabad is so managed, as to obviate all fear to the beautiful cultivation along the banks of the Eshamuttee, or injury in any way to the prosperity of the vicinity. Three or more Cuts made, —exactly parallel circumstances must occur between Hoseinabad and Koolna. Every attention, and the most careful observation, should be paid to this most essential desideratum.

Question 4th. At what expense the Cuts might be completed?

Answer. The Committee can hardly expect an Estimate of any correctness, of what is required to complete a work of the present state of which I am uninformed.

I can however point out to them, what are likely to be the probable objects of expenditure.

* Now only excavated to Low Water mark—in some places not that.

1. Clearing four furlongs of the Dansar Khal of roots, and deepening the Channel
2. Completion of its Tracking Path, and the building several rustic Bridges over Nullas not fordable that cross the path.
3. Opening 180 running feet of Excavation towards the Eshamuttee at A.
4. The Embankment or Dam, for closing the head of the Kullour Gang at X, if necessary.

5. The completion of No. 2 Cut, either by emptying the water and excavating, or otherwise as circumstances may point out.

The two first are not likely to exceed 1,000 or 1,500 Rs., if any means of Dredging are provided. Dredging Boats formed a necessary part of Major Schalch's scheme, but I am uninformed if any are yet at the disposal of the Committee.

The Third Item I should hope could not exceed 1,000.

The necessity of the Fourth Item is as yet not absolute. The largeness of the section will render piling in deep water necessary; there will at no time, however, be any great difference of level in the water on either side of the Bund; I estimate it at from 5 to 8,000 Rs.

The Fifth Item may even reach the full amount necessary for a New Canal of the same depth. I hesitate to say what I think probable, as I consider that there is a chance of creating a Channel by other means.

In the foregoing answers, the Committee will, I trust, make due allowance for the degree of restraint under which they have been thrown together, from the circumstance of my not having visited the work since April 1824, when sickness drove me from Hoseinabad.

If my avocations in this District allow me the leisure, I shall in no way grudge either the trouble or expense of a visit to the spot, and if it is in my power then to contribute any thing further in elucidation of the several points, the Committee may rely upon my communicating it, as also upon my anxiety to gain the information, for my own satisfaction, at the earliest opportunity.

I have, &c.

CHITTAGONG,
8th December, 1825.

(Signed)

THOS. PRINSEP,
Executive Engineer.

The Plans forwarded shall be returned without delay.

No. 44.

No. 125.

TO HOLT MACKENZIE, ESQ.

Secretary to Government, Territorial Department.

SIR,

I am directed by the Canal Committee to acknowledge the receipt of your Letter of the 6th October last, and to express their regret at the delay which has taken place in replying to it, but which the enquiries necessary to be made by them rendered unavoidable.

2. In obedience to the orders of Government, contained in the 2d Paragraph of your Letter above alluded to, the whole of the arms and accoutrements, &c. which were deposited by Major Schalch in the Iron Bridge Yard, have been returned by Captain Baker,

to the Arsenal of Fort William, and a receipt for them has been transmitted by that Officer to this Office for record.

3. On the subject of Outstanding Balances in the Canal Department, the Committee have no hesitation in admitting that Major Schalh has left sufficient vouchers to establish the fact, that these are due from the Contractors to the amount of Rs. 16,451 : 0 : 4½ as before stated, although they regret to add, that no part of these Balances has as yet been recovered. A Decree has however been obtained against the principal defaulter, (Pursoolah Mundle,) and a warrant for his apprehension is now in process of execution, which it is hoped will not only oblige him to come to a settlement, but have the effect of inducing others to follow his example; all other and gentler means having been tried and failed. Should the Committee be disappointed in this expectation, it is their intention to hand over a number of the Contractors, against whose names the largest Balances stand, to the Remembrancer and Superintendent of legal affairs, in order to the same steps being taken against them, as in the case of Pursoolah Mundle.

4. In reference to the 4th Paragraph of your Letter, the Committee became anxious to ascertain, how far the Cuts already in progress would be useful to the inhabitants of the surrounding districts, in the event of their being completed, independent of the general scheme of the Canal; and whether they could be finished according to Major Schalh's Plan, at no very considerable expense. For the purpose of ascertaining these facts, letters were addressed to the Members of the Embankment Committees, both of the 24-Pergunnahs and of the Zillah of Jessore, as well as to ascertain from them, whether in the event of its being determined that these Cuts should be completed, the works might not be done under the Superintendence of the Officers in charge of the Embankments; or what other temporary arrangement might be adopted for the completion of the objects in view. From both of these Committees, I regret to say, that very unfavourable answers were received; and to enable you to furnish the best information to Government on these points, I am directed to transmit to you the originals of these Papers, with a request, that you will return them to this Office when no longer required.

5. Under the persuasion, however, that Lieutenant Prinsep could alone furnish accurate information upon the first two points in the 4th Paragraph of your Letter of the 6th October, namely, the partial usefulness of these Cuts, and the probable expense of their completion, the Canal Committee addressed queries to that Officer, nearly similar to those sent to the Embankment Committees, and have only within these few days received the reports of that Officer. After a careful examination of the information furnished by Lieutenant Prinsep, and the reasoning adduced by him, the Canal Committee are led to the conclusion, that it is only by an accurate Survey of the Cuts in their present or actual state, and report upon them, by some qualified person, that any definite opinion can be formed upon the propriety or otherwise of immediately completing them, as an experiment and fair trial of the general principles and merits of the Canal. To the Members of the Committee it appears of the first importance to ascertain this fact, and as Lieutenant Prinsep is undoubtedly the individual best qualified, from previous local knowledge, to undertake the Survey and Report in question, they take the liberty to recommend, that if that Officer's services can be dispensed with for a time at Chittagong, he be directed to proceed to the spot, and furnish the information so much desired.

The Committee are induced to suggest Lieutenant Prinsep as the most proper person, from the additional consideration that it appears very probable from his last Report, pages 5 and 6, that he would not consider it necessary to incur the large contemplated expense of closing the head of the Kullour Gong, or Kyontulla Doanya, by a Bund, and that he is now the only individual who is personally acquainted with the Contractors against whom the large Balances stand, or who could be expected to induce them to work out these Balances.

6. I have also been directed to transmit two Original Reports by Lieutenant Prinsep, together with the Plan alluded to in the latter of these, and to request that they may likewise be returned to this Office when no longer required.

I have the honor to be,
Sir,

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
22nd December, 1825.

Your most obedient servant,
C. K. ROBISON,
Officiating Secretary, Canal Committee.

No. 45.

To H. MONEY,
C. R. BARWELL AND } ESQRS.
J. MASTER, } *Canal Committee.*

GENTLEMEN,

Revenue, the 29th December, 1825.

I am directed by the Governor General in Council to acknowledge the receipt of your Acting Secretary's letter dated the 22d instant, with its enclosures, and to communicate as follows:—

2. Under the circumstances now stated, His Lordship in Council resolves, that the Estate of the late Major Schalhch be relieved from responsibility for the Outstanding Balances of the Contractors, amounting to Rs. 16,451 : 0 : 4. The Military Accountant will be instructed to report the state of the account relative to the Military Stores.

3. It appears to be very desirable, that the places in the line of the Proposed Canal at which the unfinished Cuts have been made, should be surveyed at an early period by Lieutenant Prinsep, for the purposes stated by you; and that Officer will accordingly be instructed from the Military Department to proceed to make the Survey at as early a period as the other exigencies of the Public Service will admit.

I am, &c.

HOLT MACKENZIE.

No. 47.

No. 23.

To HOLT MACKENZIE, ESQ.

Secretary to Government, Territorial Department, &c. &c. &c.

SIR,

I have had the honor to receive and submit to the Members of the Canal Committee, your letter to my address of the 6th current, together with its enclosures.

2. I have been directed by the Committee to transmit to you, for the information of the Right Honorable the Governor General in Council, the following replies to the several points contained in Mr. Trower's letter, and the Report by the Tuhseeldar which accompanied it.

3. By a reference to Major Schalhch's General Report of 19th October 1824, Par. 31, it appears that a distance of 3,320 feet, from the head of the Canal to the Bridge, had been excavated to the depth of $4\frac{1}{2}$, and average breadth of 65 feet. The expense of which amounted to Rs. 4,436 : 12 : 0, being Rs. 982 : 12 : 0, in excess of the Estimate submitted to Government on the 5th April, 1823.*

* *Deepening Canal.*

Amount Authorized,	3,454	0	0
.. Expended,	4,436	12	0
Excess,	982	12	0

4. The above extent of Excavation was all that was at that time conceived to be necessary to render the Navigation of the Canal free and uninterrupted; but to ensure its remaining so, Major Schalch recommended that a Channel should be formed through the Salt Water Lake, from the termination of the Canal at Balliah Ghaut to Bamingotta, by deepening the bed of a Nullah which forms a passage for the Tide from the Sunderbuns to the lower part of the Lake near the mouth of the Canal; the soil to be taken out, being so placed as to form a Bund on each side. By this mode of proceeding, the Tide would have been admitted, and Major Schalch anticipated that it would have the effect of scouring out the Canal, and likewise prove favorable to the great Eastern Canal, *of which indeed it formed a part*. The Plan proposed by Major Schalch was approved of, and he was directed to carry it into execution, at an estimated expense of Rs. 6,331.*

Major Schalch's
Letter, 5th April
1823.

5. The work had proceeded some way, when the exceeding slimy nature of the soil obliged him to desist, until he could prepare Dredging Machines, and when he had expended only Rs. 1,451 : 7 : 6 of Rs. 6,331 authorized by Government.†

† <i>Forming Channel through Lake.</i>	
Amount Authorized,	6,331 0 0
„ Expended,	1,451 7 6
	4,879 8 6

‡ <i>Total for Canal and Lake.</i>	
Authorized, .. Rs.	9,785 0 0
Drawn,	6,000 0 0
	3,785 0 0 being

Balance remaining in Collector of 24-Per-
gunnahs' hands.

6. The Marginal Statements exhibit the sums authorized, and the amounts drawn and expended in deepening the Canal, and in forming the Tideway or Channel through the Lake ‡

7. I have been also directed to transmit to you, a Sectional Plan of the Canal, upon which the Excavations executed by Major Schalch, are distinctly put down, and from which it appears to the Committee, that all the work which Major Schalch was directed to perform on the Canal itself, was completely finished; the further operation of forming a Channel through the Lake being rendered impossible by circumstances fully explained by Major Schalch at the time.

8. The Committee have further directed me to remark on the Report by the Native Tuhseeldar, that he was, in their opinion, at no time a proper judge of the works performed by Major Schalch; and that at the period of his Report to the Collector of Calcutta, the lapse of time since the cessation of these works must have rendered it very difficult for any one, much more so for a Native Tuhseeldar to decide, how far the task assigned to Major Schalch was completed, or proportionate to the expenditure, or sums advanced to him for the object in question.

9. The Committee regret that they cannot furnish any correct information on the present state of the Balliah Ghaut Canal, nor, unless the Government could state when they propose to resume the prosecution of the *Great Canal*, will the Committee have any grounds from which to form an useful opinion.

10. The Papers which accompanied your letter are herewith returned.

I have the honor to be,

Sir,

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
14th April, 1826,

Your most obedient servant,
C. K. ROBISON,
Officiating Secretary, Canal Committee.

P. S.—As the Sectional Plan transmitted herewith is an original, and there being no Copy of it in the Committee's Office, may I request the favour of your returning it when no longer required.

C. K. R.

No. 48.

TO H. MONEY,
C. R. BARWELL AND } ESQRS.
J. MASTER, } *Canal Committee.*

GENTLEMEN,

Revenue, the 4th September, 1826.

I am directed by the Vice-President in Council to transmit to you a Copy of a letter from Lieutenant T. Prinsep, of Engineers, reporting his arrival at the Presidency. Lieutenant Prinsep has accordingly been directed to place himself under your orders, and His Lordship in Council requests that you will issue to that Officer such instructions as you may consider proper, with a view to the active prosecution of the important works upon which he has been directed to be employed, as soon as the season for active operations commences.

2. You are requested to report, for the information of Government, the amount of Salary and other Allowances, which with reference to the nature and importance of the duty entrusted to him, it will be proper to assign to Lieutenant Prinsep, in addition to his Military Pay, but without other Military Allowances.

I am, &c.

E. MOLONY,

[*Acting Secretary to Government.*]

No. 49.

No. 82.

TO LIEUTENANT T. PRINSEP,
Superintendent of Canals.

SIR,

In conformity with the Orders of Government, I am directed by the Canal Committee to request you will do them the favour to state, what Plan you propose following in the execution of the work entrusted to you during the ensuing season.

2. It occurs to the Committee, that the primary object for your consideration and attention is the speedy construction of the Ooltadanga Canal, or that proposed to be excavated from the Balliaghaut Canal to Chitpoor; but as it would, in the judgment of the Committee, be impolitic to commence on this work before the whole of the Lands that may be required for it are purchased, and as some delay may unavoidably occur in effecting the whole of these purchases, the Committee are of opinion, that considerable advantage would accrue to the general execution of the Plan, were you to look to the necessity for an early preparation of suitable and well constructed Dredging Machinery, with receiving Boats and other apparatus, so essentially requisite to be used in the Salt Water Lake, and many other parts of the line between it and Coolna. The Committee therefore request, you will do them the favour to prepare a particular Estimate of the cost of such Machinery, Boats, and Appurtenances for submission to Government, bearing in mind that a proportion of such materials are already available, being lodged in the Yard of the Agent for Iron Bridges; a List of them is herewith forwarded, and Captain Baker will be instructed to make them over to you, and which it is apprehended might be usefully adapted to a Boat to be worked by Coolies.

3. The Committee would likewise wish to be furnished with detailed Plans and Estimates of the Ooltadanga Canal, with its Harbour, Locks, Dams, Site for Iron Bridges, &c., also to be informed as to the probable period of its perfect completion, should the required Lands be purchased and cleared away, ready for working upon by the month of June next.

4. The inspection and completion of the work left unfinished by the late Captain Schalch, are in the estimation of the Committee, points of very considerable importance; it would therefore be advantageous employment of your time, whilst the purchases are carrying on of the Lands required for the Ooltadanga Canal, were you to examine the Hus-sinyabad and Bayleygunge Canals, and their continuation to Cheltaberriah, and concert measures for executing the work as speedily as possible. The Committee could wish at the same time, to be favored with a Report from you, as to the best method to be adopted, and the expense that will probably be incurred in the construction of the Dam proposed to be thrown across the Kullooar Nullah, and upon the expediency or otherwise of constructing such Dam.

5. The surveying and marking out of the different Cuts, between the Esahmuttee River and Coolna, can be done during any interval of leisure that may occur in the course of the operations of the approaching season; but the Committee remark, that no Excavations should be attempted throughout those proposed Cuts, until considerable progress has been made in the construction of the Ooltadanga Canal.

6. The Committee request, that the points herein specified may be maturely considered by you, and in the event of its appearing hereafter to be requisite in your judgment that any modification of the Plan of operations laid down in this Communication would be desirable, you will of course submit, through their Secretary, your sentiments respecting such alterations.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
19th October, 1826

I have &c.
(Signed) J. N. JACKSON,
Secretary, Canal Committee.

No. 50.

TO MAJOR J. N. JACKSON,
Secretary to Canal Committee.

SIR,

Revenue, the 9th October, 1826.

I am directed by the Vice-President in Council, to acknowledge the receipt of your Letter dated the 25th ultimo, and to request, that you will inform the Committee, that His Lordship in Council has been pleased to authorize Lieutenant Prinsep, to draw a Salary of 1,000 Rs. per Mensem, exclusive of his Military Pay as recommended by them, to have effect from the 1st instant: and to entertain the Establishment specified in the margin* at

* 1 Sircar,	25
1 Writer,	30
1 Tindal,	6
10 Clashes at 5,	50
Stationery, Instruments, &c.	100

Total 211

an expense of Rupees 211 per Mensem.

2. His Lordship in Council does not deem it expedient to fix the allowance for Boat Hire and Travelling Charges to be drawn by Lieutenant Prinsep, and desires that he may submit Contingent Bills for sums actually disbursed by him for such

purposes, charging the usual rate of Boat-hire for any Boats that may be his own property, whilst they are actually employed on the public service.

3. The Committee were, by the orders conveyed in my letter of the 14th ultimo, requested to issue such instructions as might seem necessary to Lieutenant Prinsep. The correspondence, however, which has passed with the Board of Revenue, relative to the obstructions reported to exist in the Eastern Canal, as well as Mr. Acting Secretary Robison's letter of 14th April last, the receipt of which is hereby acknowledged, having again come under consideration, I am further directed to communicate to you, for the information of the Committee, the following observations relative to the immediate operations to be conducted by Lieutenant Prinsep:—

4. The Eastern Canal being a work of the greatest importance, both from its admitted utility and the return which it is expected to yield for the sums expended on it, will of course claim the earliest attention of the Committee: adverting, however, to the Orders which have been received from the Honourable Court of Directors on the subject of this work, His Lordship in Council considers it proper to direct, that the further progress to be made in it shall for the present only extend to securing the Land which may be requisite to ensure its ultimate completion, when the numerous advantages of the work which have been submitted to the Honourable Court shall, as is confidently anticipated, have induced them to give their full sanction to the undertaking.

5. To suspend entirely all measures connected with this Canal, would indeed not only amount to a sacrifice of a considerable portion of the money which had been laid out on it before the Orders of the Honourable Court were received; but as Land in the vicinity of Calcutta is daily increasing in value, the Canal could not ultimately be completed for the sum originally estimated; and although it is not desirable that any considerable sums shall be disbursed immediately, in furtherance of the general object, yet there seems to be little doubt that the purchase of the Land required, while it can be obtained on reasonable terms, will in the end be productive of no small advantage, particularly as it seems probable that the Land purchased can easily be let to individuals for the purpose of brick-making, thereby yielding a small rent, and ultimately reducing the labor and expense of excavating the Canal, when the work can be actively prosecuted.

6. But even if the Honourable Court shall consider it expedient to direct, that the Canal shall be altogether abandoned, His Lordship in Council has no doubt, that any Land which may be purchased with a view to the completion of the work, can easily be resold at a price equal to, if not higher than, what it can now be purchased for; and therefore there does not appear any ground to apprehend an ultimate loss, even in such a view of the question.

7. Under these circumstances, the Committee are requested to ascertain and report to Government, the extent of Land which will be required for the completion of the whole line of Canal to its junction with the Hooghly, as well as the terms on which it can be purchased; and in carrying this arrangement into effect, the Committee are requested to adjust the price to be paid for the different parcels of Land in such a manner, as to render the disbursement on account of it as gradual as may be consistent with the object in view.

8. In regard to the immediate operations to be undertaken by Lieutenant Prinsep, His Lordship in Council conceives, that Officer may be usefully employed in removing the obstructions stated to exist in that part of the Eastern Canal already open, and in deepening and bunding the Channel which was proposed by Major Schalk, through the Salt Water Lake, as described in the 4th Paragraph of Mr. Robison's letter above adverted to, so as to render the whole line from the Sunderbuns completely navigable.

9. Of the sum already authorized for the above purpose, there still appears to be a

Balance in the hands of the Collector of 24-Pergunnahs, amounting to Rs. 3,785, upon which the Committee will be authorized to draw, and they will of course report to Government in regard to the further advances, which may be required to complete the work.

10. It will at the same time be advisable that Lieut. Prinsep should examine and report upon the actual state of the Hussingabad Canal, in order that such repairs may be made to it, as will prevent injury to the part which has already been excavated.

I am, &c.

[Signed E. MOLONY,
Acting Secretary to Government]

No. 51.

(Copies.)

No. 2.

To CAPTAIN J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

SIR,

1. I have the honor to acknowledge your letter No. 82, of 19th instant, and in reply, have to offer the following observations upon the several points therein enumerated:—

2. With respect to the Ooltadanga Canal, as the period of its commencement must depend upon the proceedings of the Canal Committee in purchasing the ground, (upwards of $\frac{2}{3}$ ds of which remain to be effected,) I cannot hope to be allowed to include it in my general scheme of operations during the ensuing season. It will be almost unnecessary I believe for me to state my conviction, that the ultimate pecuniary advantage to be expected from the Scheme of the Canal, depends mainly upon this, its most essential part, and to remind the Committee, that the later its execution, the more distant will be the prospect of any return whatever.

3. The detailed Plans and Estimates which I propose during the season to prepare and submit to the approbation of the Committee for this part of the work, in which I intend the introduction of several alterations from Major Schalch's original Scheme, both improving and economising the work, will, I have no doubt, be received with approbation. I may hereafter have the honor to submit to their consideration, the propriety of boring during the present season, to discover the nature of the soil where Bridges or Rivetments of any kind are to be constructed, in order to create greater accuracy in the Estimates.

4. I now have the honor to submit what I consider to be the most advisable general scheme of operations for the present year, from which I exclude the Ooltadanga Canal for the above reasons; although, should the Committee conceive it possible to assign any portion of the ground for this year's excavating, (even $\frac{1}{2}$ a mile,) I should judge it advisable to commence the excavation of so small a portion, even should it be necessary to abridge the present scheme for the purpose.

5. Major S.'s operations in the Salt Lake have already pointed out the impossibility* of clearing a Channel through it, by any other means than Dredging.

6. I therefore propose immediately to fit up, in the most economical manner possible, the frame and buckets now in Store. The Machinery may be erected upon two Native Boats of 500 or 600 maunds burthen, and smaller Boats of the country may be made use of, for carrying away the mud. I enclose a memorandum of what I estimate will be the expense of this

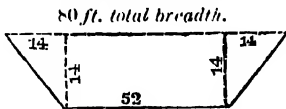
measure, which if successful, may be enlarged upon by the construction of a strong flat-bottomed Boat for the purpose. As there are not sufficient cog-wheels in Store, and no shafts or gudge on steps for any part of the Machine, it may be necessary to have recourse to Messrs. Jessop and Co., or other ironmongers, to make up the deficiency. My Estimate is therefore liable to some uncertainty on account of their rate of charges. As I can, however, construct the principal part of the work under my own eye in Captain Baker's Iron Bridge Yard, (unless that Officer's work would be inconvenienced by my so doing,) I am in hopes the Machine will cost even less than this Estimate.

7. In conversing with Mr. May, the Superintendent of Rivers, I anticipate the possibility hereafter of arranging with that gentleman for the use of his Dredging Apparatus for three months during the year, an arrangement that cannot be viewed otherwise than as advantageous and economical to both undertakings. The Committee will, however, I have little doubt, see the necessity and advantage of making some use of the Machinery in store, especially if an early trial can be made of this method of Excavation, (which is likely to be resorted to in so many instances,) at a small expense.

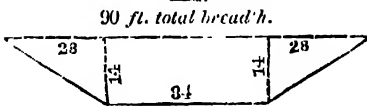
8. The line of Canal which in my opinion should occupy the attention of the Committee during the ensuing season is, the series of Cuts from Hoseinabad to Chultabarya and the Salt Lake, with the completion of those left unopened.

9. I have already visited the Hoseinabad and Bayley Gunge Canals. The former has suffered from the sliding of its Banks, by which 4 to 5 feet of its depth has been filled up.

MAJOR SCHAICH'S SECTION.



PROPOSED NEW SECTION.



The slope given to the Banks was evidently too great (45°) and I would earnestly advise an alteration as per margin in the section for Excavation. This filling up is not of material consequence, inasmuch as there will be more than sufficient current when the water is admitted from the Eshamutte River to clear it out. The Bayley Gunge Cut is in nearly the same state as when left in 1824. During my visit in September, there was 5 feet average of water, and as the Tide had access from its Western extremity, it would be left in general dry by the Ebb

Tide of the present month, but for certain obstructions across its Channel. It will therefore be possible to continue its Excavation to the full depth, except for a short distance where oozing sand has been discovered. The Dam at X. mentioned in my former communication of 8th December, 1825, will, I expect, still be found necessary, and as I may expect that its accomplishment might render this expensive method of finishing the Bayley Gunge Cut unnecessary, I shall at present not offer any distinct Plan of proceeding relative to this part, until a few more visits to the spot enable me to submit something more satisfactory on the subject.

10. I propose, if the Committee approve, to employ Coolies, (Hillmen if possible,) in clearing the Jungle and excavating two parallel Ditches of $3\frac{1}{2}$ to 4 feet depth, one to denote each side of the Canal and furnish earth for the formation of a bund of enclosure along the remaining $5\frac{1}{2}$ miles, from the Western extremity of the Bayley Gunge Cut, to the proposed junction with the Chowmook Nullah. This method, which will cost from 1,000 to 1,500 Rs. per mile, will be found very advantageous, as preparing the ground for Excavation during the following season.

11. I propose further, as this would occupy very little of my time, to survey and excavate by contract during the present season, the Cut of $1\frac{1}{2}$ mile sanctioned between the Chultabarya Nullah at Gabtulla and the Bungur Nullah at Dara; I can prepare the ground for the contractors by December.

12. The several objects which I could undertake under my own personal supervision, with hopes of their completion during the season, are therefore as follows :—

First. The Dredging Apparatus and its trial upon the Channel through the Lake.

Second. A Cut of $1\frac{1}{2}$ mile in length from Gabtulla to Dara.

Third. The clearing, bunding and boundary Ditches of the line from Bayley Gunge to Chowmook, preparing the ground for excavation during the following year.

Fourth. Concerting proper measures for the completion of the unfinished Cuts, and if necessary, the construction of the Dam at X.

13. I hope the Committee will not consider the scheme too confined for the season's operations, and less than I could undertake, without assistance from European Overseers. Any interval of leisure will be employed in digesting the Plans proper for the Canal of communication between the Lake and River at Chitpoor, and in surveying the tract Eastward between the Eshamuttee and Coolna.

14. My operations would be greatly forwarded by the assistance of one or two European Overseers, if such could be procured; one to superintend the Dredging Machine, who must however already possess some knowledge of Mechanics, to enable him to prove at all useful. Another to superintend the Jungul clearing West of Bayley Gunge, and to be available in case the Dam at X is commenced upon this year.

15. I have to request that a copy of the list of Defaulters, with the amount of their Balances may be furnished me, as it may be in my power during the progress of the work, to recover some portion of the amount, and that sufficient funds may be placed at my disposal for proceeding with the whole, or such portion of the above scheme, as the Committee may finally authorize.

I have &c.

(Signed)

THOS. PRINSEP,

Lieutenant, Engineers.

CALCUTTA,
SUPERINTENDENT OF CANALS OFFICE,
26th October, 1826.

No. 52.

(Copy.)

No. 87.

TO LIEUTENANT T. PRINSEP,

Superintendent of Canals

SIR,

I am directed by the Canal Committee, to acknowledge my receipt of your letter under date the 26th ultimo, together with the Estimate that accompanied it.

With reference to the orders of Government, and to the probable period that will be required for the final adjustment of the purchase of all the Land to be included in the line of the Ooltadangah Canal, the Committee are of opinion, that your earliest attention should be directed to the preparation of the Dredging Machinery, in the manner you propose, and on the Estimate submitted by you; at the same time the Committee, from past experience, wish to impress you with the urgent necessity of observing great caution and exactness in all engagements that may be entered into by you, with a view to the performance of this branch of the duty committed to you.

In the conclusion of the 6th Paragraph of your letter, it is observed by the Committee, that you proposed executing all your ironwork in the Yard of the Agent for Iron Bridges; the Committee see no objection to this Plan, provided it does not materially retard or interfere with Captain Baker's own operations, or inconvenience the progress of his works.

The detailed Plans and Estimates you have been called upon to prepare, the Committee conclude will be finished by an early period of the season, and that they will be transmitted, accompanied by such observations and suggestions as the course of experience may induce you to consider useful; the propriety of boring during the present season to enable you to observe the greater accuracy in the preparation of your Estimates, and to ascertain the precise nature of the soils where Bridges or Rivetments of any kind may be found necessary, is so obvious, that they are of opinion, no time should be lost in carrying that operation into immediate effect.

You will as early in the season as possible, attend to the completion of the series of Cuts from Husseinabad to Chaltaberria and the Salt Lake.

With regard to the operations you intend adopting in completing the Bayleygunge Canal, the Committee are prepared to authorize you to carry them into effect in the manner you have suggested.

The Committee are induced again to press on your attention, the necessity for entering into a minute examination relative to the expediency or otherwise of constructing the Dam at X, as noticed in your Report of the 8th of December, 1825, and will be highly pleased to find that a few visits to that spot shall have enabled you to furnish them with a full and satisfactory Report on the question in all its bearings.

The Committee are disposed to approve highly of the Plan suggested in the 10th Paragraph of your Letter now under reply, and beg that no time may be lost in carrying it into effect.

The Committee, I am directed to observe, are fully satisfied that you will avail yourself of every opportunity that may offer itself for expediting the operations of the Plan generally, during the season for active operations.

With regard to the European Overseers, required by you, I am directed by the Committee to observe, that whenever you are prepared to point out the source from whence they can be drawn, and the expense of entertaining them, the propriety of sanctioning that measure will be duly considered.

In conclusion, I have the honor to forward a List of Defaulters, with a specification of the amount of their several Balances, as required by you.

I have &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
3rd November, 1826.

(Signed) J. N. JACKSON,
Secretary, Canal Committee.

(True Copies,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 56. b.

(Copy.)

Report upon the State of the Balyaghaut and Entally Canals.

1. The Entally Canal deepened in 1823-24, by Major Schalch, from 3 to 7 feet, has now scarce 4 to 5 feet of water throughout its course. The Balyaghaut Canal untouched by Major Schalch, has at present a mean depth of $3\frac{1}{2}$ feet: in some places only $2\frac{1}{2}$. The very short period in which the former of these Canals has become unservicable from the filling of its bed, induced me to observe more particularly the causes of such evil. The following are my views on the subject:—

2. Any operations in merely deepening the present Channel, would I fear, disappoint the Committee in their object of permanently securing the Navigation. The present section and nature of the Canal is defective in the extreme. Considerable alterations will be necessary before I can anticipate much satisfaction from the result of any measures for its improvement.

3. The influence of the Salt Lake creates a perfect stagnation in these Canals during the present and remaining dry months of the year; and the current during the rainy season rarely exceeds half a mile per hour at the extreme.

4. The present Banks are disposed at such an angle (greater than 45°), that it is impossible to prevent the continual crumbling of the bank from exposure to rain.

5. The Entally Nullah now forms the receptacle for all the Drains of the City, South of Boitacouna, and of some part even North of that Street; the rubbish and filth from these Drains; an occasional irruption of turbid River water from Tolly's Nullah by the Circular Road Drains; and the crumbling of its Banks, with the washings of the Cutcha Roads on each bank drained into the Canal, together, accumulate a mass of sediment which the tardy current of its water is not sufficient to carry away.

6. Hence, the cause of its continual choking. A perfect remedy for these evils cannot be easily furnished; because, in the first place, it would be disadvantageous, nay even dangerous to the Drainage of the City to allow of any alteration of the Nullah, which should create a rise in the level of the waters of the Canals, now barely 2 feet below *gill of the Drain at the head of the Dhurrumtullah.

query, "the sill"
"floor."
J. M.

7. The mean level of the Western end of the Lake, which now varies only 10 inches during the year, and which is affected not above 10 inches by Tides, must be assumed as below the general flood level of the Sunderbuns; it would therefore be highly injudicious to pursue Major Schalch's Embankments intended to follow the Canal through the Lake; as the influence of its body of water, now so useful in preserving the present level, would be destroyed by such measure.

8. To prevent any further injury from the crumbling of its Banks, it will be necessary to sacrifice 8 feet at least of the present road on each side to form a proper slope, which should be well sodded after its inclination is perfectly adjusted, and the roadway itself sloped gradually outwards, and not towards the Canal, as at present.

9. The space left would not suffice for a carriage road, the present roadway being narrow; it therefore becomes advisable to procure a narrow strip of ground in addition for the purpose: or otherwise to abandon the road on one side for the sake of the two slopes, and a good roadway on the other side.

10. The latter Plan will become difficult in the Entally Canal, which is provided with a road only on one side.

11. I am not at present fully prepared to offer to the Committee any Plan which would ensure the permanency of the Canal, or prevent its liability to suffer by many of the same causes of destruction that exist at present. I will however suggest, what I should recommend as actually necessary, and what appears to my judgment as the most advisable method of proceeding now in our power.

12. A portion of the Balyaghaut Canal East of the Bridge, will become part of the Canal of communication with Chitpore; it will therefore be highly desirous to execute this part of the work in the most effective manner, and I should hope the following scheme worthy of the attention of the Committee for this year's undertaking.

13. To deepen the Canal from the Coolya Bridge, to the Lake being $\frac{3}{4}$ mile in extent, to the full depth of $7\frac{1}{2}$ feet by Excavation.

14. As it is impossible to get rid of the water by Drainage where the Tide has so little influence, the whole length may be divided by Dams transversely into portions of conve-

nient length, to enable me to pump out the water of one or two portions in a few days. In this manner by excavating each portion in succession, commencing from the outer ends, I shall avoid the expense of pumping out the whole water in the Canal, besides leaving a certain portion always open in which Boats may remain.

15. I should also earnestly recommend my suggestion of giving the Banks of the whole extent of Canal, a better inclination. I however leave it to the judgment of the Committee to weigh the relative advantages of the two methods proposed in the 9th Paragraph. The first of these methods would certainly be preferable for that portion of the Canal, which will form a part of the grand Canal of communication.

16. The Channel through the Lake must be undertaken by Dredging Machinery, I need therefore not refer to it on the present occasion.

17. An abstract Estimate accompanies this Report of what I consider will be the probable expense of deepening the Channel and sloping the Banks, exclusive of any purchase of extra ground, which can be better estimated in concert with the Aumeen, now employed in making similar purchases by the Committee.

CANAL SUPERINTENDENT'S OFFICE,
November 20, 1826.

(Signed)

THOS. PRINSEP, *Lieutenant,
Engineers.*

To CAPT. J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

(A true Copy.)

J. N. JACKSON,
Secretary, Canal Committee.

No. 56. *b.*⁽¹⁾

(Copy.)

Estimate of the Expense necessary to deepen the Ballyghaut Canal and reslope the Banks.

	<i>Amount</i>	<i>Grand Total.</i>
To deepening 30 feet mean width, to depth of 4 feet, throughout the Channel of 4,000 feet, length in all, 658 Chowkas, at 2/8. 	1,645 0 0	
„ Scarping the present Slopes to the East of the Bridge, Section on each side, estimated at 25 sq. feet, total length 4,000, in all 200,000 or 274 Chowkas at 2/4	616 8 0	
„ Sodding the Slopes, which at 11 feet width each Bank, for 4,000 feet, include 88,000 sq. feet at 12 Annas per 100 sq. feet, 	660 0 0	
„ Partition Dams and their removal afterwards, including expenses of emptying water by pumps or otherwise, 	500 0 0	
„ Add Supervision, unforeseen Contingencies, &c. 10 per cent on the amount, 	342 0 0	
Carried over, 	Sicca Rs.	3,763 8 0

Brought forward, Sicca Rs. 3,763 8 0

Expense necessary to new slope the Banks of the Entally Nullah, if thought necessary.

To Scarping 3,500 feet of the Banks of the Entally Nullah			
West of the Bridge, estimated 250 Chowkas, at 2/4	562	8	0
„ Sodding 77,000 sq. feet at 12 Annas per 100 feet, ..	577	8	0
	<hr/>		1,140 0 0
Total Sicca Rupees	..	..	4,903 8 0

CANAL SUPERINTENDENT'S OFFICE, (Signed) THOS. PRINSEP, *Lieutenant,*
November 20, 1826. *Engineers.*

TO CAPTAIN J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

(A true Copy,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 60.

MY DEAR PRINSEP,

I have read over these letters, and think the first object should be to deepen and clear the Entally Canal, and make a Channel through the Lake.

All Canals through which the Tide is allowed to flow, will require constant clearing, from the deposit of the water ; and the Entally Canal has no doubt been filled up, owing to the cause stated by Lieutenant Prinsep ; but I am of opinion, from the observation made by me, some years since, that there is no necessity for converting the Canal into a Drain ; for the end of the Durrumtullah Drain may be turned to the right or left of the Canal, and the water carried into the Lake, in the same way as is now done through many other Drains, which were constructed by Elliot, at my suggestion, along the Circular Road ; for the descent towards the Lake in all directions is so great, that it requires little artificial aid to allow the water to flow.

If the Drains of the Town are turned from the Canal, it is probable, that when it is deepened, that it will continue servicable for a much longer time. I differ in opinion as to the effect of Bunding a Channel through the Lake ; whether the Entally Canal is to remain the outlet of the Town Drains or otherwise, no injury will follow the Bunding of a Channel through the Lake, if the East and toward the Sunderbunds, is left open ; for then the East end of the Lake will be left open for the water to flow into the Sunderbunds, and the Bund would tend to preserve a deep Channel when once made.

If *a. b. c.* were Bunded through the Lake H. I. J. *b.*, the drainage of the Town through the Drains 1—2, 3—4, 5—6, 7—8, 9—10, 11,—12, would find its way into the Lake on the side H, *b*, J, and out at the Channel I, without causing any rise of the water; and even if the Entally Canal were continued to be the Drain, it would make no great difference, if the Bund which is made from *a, b*, were to be continued from *b*, to *c*; but the filth of the Town would always have a tendency to fill the Canal to the level of the Drain at *a*, on the Circular Road, and it always struck me that the end of the Drain at *a*, should be carried into a vertical Masonry Tunnel, with an outlet at the bottom, below the Level of the Canal, if the Drain were to continue to flow through it.

I do not think that increasing the Breadth of the Entally Canal, or adding to the Slope, will be of any great benefit in preserving the depth of the water; for so long as it is made the Drain of the Town, and a great flow of water passes through it, the friction will operate the same as in all Rivers, whether small or great, and there will be a tendency to encroach alternately to one side or the other, in proportion to the resistance of the Bed of its Channel. The great object to be attained in all Canals of the kind is to prevent any flow of water, which can be only effected through the aid of Sluice Gates, which are not expensive when the Level, as in Bengal, is much the same, for few are required.

In the proposed Plans of operation, I observe much time will elapse, before the communication with the Ganges can be completed; and till the end is nearly attained, I see no use in purchasing the ground between Manicktollah Road and the Canal, estimated to cost 2,89,920 Rupees, the price considering the site, appears to me to be very high, for at present it can be only valuable as Paddy-ground, and any delay in obtaining possession is not likely to add to the cost. It can make no difference, whether the Canal is carried 300 or 400 yards nearer the Town, or otherwise to the Hooghly at Chitpore, and if the proprietors of the ground refuse to sell where the Canal is marked, it will be easy to go by a route a few yards more to the East, where it may be obtained on more reasonable terms, and nothing will be lost by delay, and much gained; for we can ill afford to expend so much.

It has been stated, that no return will be yielded till the Canal is finished. I am of a different opinion, and would recommend that Cuts of communication with the *ends closed*, may be constructed from the East of the Entally Canal, in the proposed direction to Hussenabad, and also from Balleygunge, for the conveyance of Goods, and that Tolls be collected from Boats passing on them. If 3 feet water can be retained, they will answer every useful purpose, and afford the Public a cheap and easy communication. The labour of loading and unloading light Boats is trifling, and goods are now conveyed along the Diamond Harbour Road in the Rains, for miles, to within a few miles of Calcutta.

If such Cuts are made, commencing from the East end of Entally, every mile of communication ought to be made to pay, and the progress of the Canal will be going forward, till the whole is nearly ready, without any part of it filling up by the deposit of the Tide Water, and the most expensive part will be left to the last, and till we are enabled to reduce our expenditure to the scale of our income, and can better afford the outlay, than at present.

Yours truly,

H. WOOD.

31st December, 1826.

P. S. I have said nothing about the payment. The best mode would be a Treasury Note bearing five per cent. interest, payable at the expiration of two years, the interest to be payable half yearly. If the five per cent. Loan Note should not be acceptable, but as above stated, it will be better to postpone the purchase.

No. 63.

No. 222.

To J. N. JACKSON, ESQ.

Secretary to the Canal Committee.

SIR,

I am directed to acknowledge the receipt of your letter and enclosure of the 10th instant, and to transmit for the information of the Canal Committee, the accompanying Memorandum prepared from the Records of this Office, from which it appears, that the aggregate quantity of Lands purchased at different times for the formation of the New Canal and Roadways, consists of Beegahs 149 : 2 : 14, and that the breadth of the space intended to be assigned was 150 feet ; viz. 90 feet for the Canal, and 30 feet each side for the Roadways ; but that in a particular spot on one Bank, 60 feet had been purchased instead of 30 on each, wherefore it became necessary to effect the purchase of the 6 Cottahs that is mentioned in the concluding part of the accompanying Memorandum, in order that the original design of Mr. J. Shakespear, of leaving a space of 30 feet on each side of the Canal, might be uniformly observed.

I have &c.

(Signed)

G. A. BUSHBY,

Acting Secretary.

BOARD OF REVENUE,
LOWER PROVINCES,
The 19th January, 1827.

No. 63. a.

MEMORANDUM.

The Committee for improving the Town of Calcutta, in an address under date the 27th October 1807, having submitted to the Governor General in Council, the necessity of re-opening the Canal from the Marhatta Ditch to the Salt Water Lake, recommended that a Revenue Officer might be deputed for the purpose of ascertaining, whether the ground which occupied the site of the Canal was public or private property, also to purchase such additional ground as might be requisite for forming a New Canal, from the Point mentioned to the Salt Water Lake, of 30 feet in breadth.

Mr. J. Shakespear having been deputed on the above, made a report on the subject, on the 22d January 1808, and from the abstract which accompanied it, of the expense that would attend the purchase of Lands required for opening the Canal, it appeared, that the Land ascertained to be the site of the old Water-course, and taken as public property to which no claims were preferred by individuals, consisted of Beegahs 6 : 9 : 12½, and that it was necessary to purchase additional Lands to the extent of Beegahs 22 : 15 : 6½, making altogether Beegahs 29 : 5 : 3.

Mr. Shakespear, however, took the opportunity of submitting his sentiments on the benefits to be expected by extending the Water-course into a navigable Canal, reckoning that 90 feet would be required for its breadth, and 30 feet on each side to deposit the excavations on ; in all 150 feet.

Mr. Shakespear's suggestion for making a Navigable Canal, instead of a small Water-course for the mere purpose of Draining the Town, having been brought to the notice of Government by the Revenue Board, that gentleman was deputed, agreeably to the orders of Government of the 4th March 1808, to adjust the price of the Ground for the proposed Canal.

From the abstract of the detailed Estimate of the expense for the purchase of Lands required for the formation of this Canal, which was submitted by Mr. Shakespear, and forwarded to Government on the 1st of July 1808, it appears that the Land ascertained to be the site of the old Water-course, and taken as public property, consisted of Beegahs 13 : 12 : 2, and that it was requisite to purchase from individuals Beegahs 125 : 4 : 12, making in aggregate, a quantity of Beegahs 138 : 16 : 14.

In consequence of a letter from the Board of Revenue, requiring further explanation of the principle on which Mr. J. Shakespear had adjusted the compensation to be paid to the owners, whose Lands were to be appropriated to the purposes of the New Canal, it appeared, that in his former Estimate, there was a deficiency of ten Beegahs, which he had since discovered, and this he explained in a Letter dated 29th July 1808 ; consequently it would be requisite to purchase from individuals, Beegahs 135 : 4 : 12, making, with the site of the old Water-course, viz. 13 : 12 : 2, Beegahs 148 : 16 : 14 Chittaks.

It was afterwards brought to the notice of Government, that instead of 30 feet on each side of the Canal, that 60 feet had been procured on one Bank, and in consequence the track-pathway was intersected on the one Bank by private property, consisting of 6 Cottahs belonging to Beebee Jaun, and her two immediate neighbours, Govindram Bagdee and Gour Hurree, and that the workmen had thrown a considerable quantity of earth on these premises.

The necessity of effecting this further purchase was represented to Government by the Board on the 10th April 1810, and Government were pleased to authorize the conclusion of the purchase. On the 21st of the same month, Mr. Assistant Collector Revelly, to whom had been entrusted the duty of adjusting a compensation for Ground that was taken up by Government to construct four Roads about this period in the vicinity of the New Canal, was directed to effect the purchase of the above 6 Cottahs belonging to Beebee Jaun, &c.

It accordingly, from the correspondence which has been referred to on the Records of this Office, appears, that the first purchase after it was determined

to construct a New Canal, consisted of Beegahs,	135	4	12
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That the one just mentioned consisted of Cottahs,	0	6	0
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And that the whole Ground after the completion of these purchases, in the possession of Government, including the site of the old Water-course. . .	13	12	2
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consisted of,	Beegahs,	149	2	14
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(Signed) G. A. BUSHBY,
Acting Secretary.

No. 72. b.

No. 2.

Account of the quantity of Ground required to be purchased to complete the breadth of the Road on the South Bank of the Canal to 24 feet.

From A. to B.	Length.	Breadth.	Sqr. ft.			
Property of Saik Abdulla, ...	50	× 10	500			
Ditto Henry, ...	275	× 12	3,300			
<hr/>						
From C. to D. New Sloping,				Bgs.	Cots.	Chts.
			3800	0	5	4½
Moonshee Ameeruddee, ...	320	× 7	2240			
Mr. Blechynden, ...	350	× 3	1050			
<hr/>						
			3290	0	4	9
<hr/>						
Total, ...				0	9	13½

(Signed) THOS. PRINSEP, *Lieut. Engineers,*
Superintendent of Canals.

CALCUTTA,
CANALS' SUPERINTENDENT'S OFFICE,
19th March, 1827.

No. 77.

No. 52.

To MAJOR J. N. JACKSON, *A. Q. M. G.**Secretary to the Canal Committee.*

SIR,

Before commencing operation for Dredging and deepening the Salt Water Lake Canal, I deem it necessary to call the attention of the Canal Committee to several circumstances, and some abuses now existing in the Navigation of that passage, which appear greatly to need the interference of the Police or executive power, as guardians of the thoroughfare, without which all endeavours to perfect this communication with the City will be nugatory.

2. I cannot find on inquiry that any Regulation has been even promulgated for the preservation of the navigation in this Channel from obstructions arising from wrecks, the fixing of fishing stakes, or other causes within the reach of remedy, and certainly none appear to be enforced, although the Navigation has suffered, and daily suffers from such causes.

3. The utmost vigilance of the Police appears to be insufficient to keep the Channel clear of Wrecks and sunken Boats, with which the passage is now so obstructed from $\frac{1}{4}$ of a mile within the Balyaghaut Canal to $\frac{3}{4}$ of a mile East of its disembouement into the Lake, that a boat of any ordinary size can with great difficulty and peril make its passage. And at present, it would be impossible for the Dredging Boats to be brought to the shoal water at the mouth of the Balyaghaut Canal, where excavation is first needed.

4. A practice exists among the proprietors of the large Wood Boats of 2 to 4000 mds. burthen, drawing when laden 7 to $9\frac{1}{2}$ feet water, which otherwise deliver their freight to the Lighters or (Obra Boats of 150 mds.) at the distance of about 2 miles East from Balyaghaut, of bringing all their condemned Boats into the shallow water at the mouth of the Canal, where they frequently sink in the Channel, and are either totally abandoned as wrecks by the owners, or left till some purchaser is found to break up as much as he finds it worth his while to carry away. At the present moment in one space in the Canal, (having generally 5 to 7 feet water,) of 200 feet in length, there are no less than 7 of these boats sunk; none of which will be removed for some considerable time without the interference of the Police, and none will ever be entirely removed.

5. Another practice exists among the owners of the small Craft that act as Lighters, few of which are very water-tight, (having generally been constructed from the breakings up from the above-mentioned wrecks,) of allowing their Craft, when unemployed, to sink indiscriminately in any part of the Canal, choosing in preference the shallowest parts. Their being under water, preserves the seams from opening, and it is a matter of the greatest ease to refloat them when required.

6. During the last six months, the number of Boats wrecked between Baminghatta and the Eastern Canal has been unusually great. The loss has not been entirely limited to the firewood Craft, which as being generally of least substantial construction, suffer most. I have observed during this period, that by far the greatest obstruction to the Channel has been occasioned by the abuse above-mentioned;* for when a Lime or Grain Boat is wrecked, the crew and owners take immediate measures to save the Cargo, and raise the wreck. The same happens with all the better description of Craft, and even with the new Wood Boats. It is not, however, the case with the generality of Wood Boats sunken, and seldom with any large Wood Boats of 2 to 4,000 mds. which wreck in the shallow water at the West end of the Lake Channel; for in the first place, by far the greater number of Craft employed in the firewood trade are of very inferior description, old and decayed; in the second place, few of the latter description (2 to 4,000 mds.) are brought so near the City, except when condemned or wanting repair, and if in their passage to the shoal water at the end of the Balyaghaut Pucka Road, (where boats are usually hauled up for such purpose,) they sink in the Channel, they are abandoned. A purchaser of the wrecks seldom removes more than he can reach at low water-nucleus, is thus left for the aggregation of mud, and sometimes of other wrecks, upon the many projecting pieces left in the bed of the Channel.

7. The object of the present observations is to induce the Committee to call the attention of the Magistrate to the subject, in order that [by] his interference, as many wrecks as the owners may be induced to remove, may be so without delay, and to request their sanction to my incurring any expense that may be necessary in removing the remainder, previous to the arrival on the spot of the Dredging Machinery.

8. At the same time, as I cannot but be sensible that a great portion of the obstruction arises from abuse rather than accident, I cannot refrain from suggesting the propriety of some regulations for the future preservation of the Navigation.

9. A mulct and forfeiture of the wreck appears to be justly merited by any owner who makes no exertion within even 48 hours to remove such wreck out of the passage, where it endangers other property, and obstructs the Navigation. The practice of allowing boats

to remain sunk for their preservation in the Channel, should be wholly prohibited, and visited with a heavy fine, or immediate forfeiture of the boat. The large Wood Boats might be limited according to their draft of water to certain distances.

10. It is far from my intention, however, to do more than suggest the objects which require remedy, and to point out the necessity of some rules for the maintenance of the Navigation. Without some penalty, it appears impossible to induce the Natives to consider the hindrance offered to the public by their boats remaining sunk as at present for months, and I should conceive that ultimately the produce of any fines that may be levied, and the sale of forfeited wrecks, would suffice to pay the expenses of their removal in such shallow water, and of any Establishment necessary to give the necessary notice when the assistance of the executive is required to raise a wreck.

11. The Committee who have ever been alive to the improvement of the Inland Navigation in the vicinity of Calcutta, will be more competent to frame any rules necessary for its good management; and I have to request their indulgence, if I have overstepped the line of my duty in bringing such subjects to their attention. In the meantime, as my Dredging operations will soon commence in the Lake Channel, I have to request their early consideration of the request conveyed in the above Paragraph No. 7.

I have, &c.

CALCUTTA,
CANAL SUPERINTENDENT'S OFFICE,
19th June, 1827.

(Signed)

THOS. PRINSEP, *Lieut. Engineers,*
Superintendent of Canals.

No. 78.

(No. 120.)

To J. MASTER, ESQ.

Magistrate of the 24-Pergunnahs.

SIR,

I have the honor, by desire of the Canal Committee, to transmit to you, the annexed Copy of a Letter from Lieutenant T. Prinsep, Superintendent of Canals, dated the 9th instant, bringing to the notice of the Committee the existence of certain abuses in the Channel of the Salt Water Lake, and at the entrance of the Baliaghaut Canal, tending to impede the Navigation of that passage, and suggesting such remedies as appear to him calculated to remove the evil complained of, and prevent its future occurrence.

The Committee being aware how essential it is to the interests of the City that this Channel of Communication should at all seasons of the year be kept free and clear from obstructions of any kind, that might operate to retard the Navigation, or cramp the extensive Trade that passes through it, have directed me to request, that you will oblige them by adopting such necessary measures for clearing the Channel of the Sunken Boats that at present prove so great a source of hindrance to the Trade, and for the future preservation of the Channel from similar obstructions to those now complained of, as may appear to you best suited to meet that object.

I have, &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
18th June, 1827.

(Signed,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 79.

(Copy.)

To MAJOR J. N. JACKSON,

Secretary to the Canal Committee.

SIR,

On the receipt of your Letter of the 8th June, which was accompanied by a communication from Lieut. Prinsep, Superintendent of Canals, I adopted immediate measures for clearing the Salt Water Lake Canal, and for removing the obstructions which Lieut. Prinsep had brought to the notice of the Committee.

It was at that time remarked by the Members, that the removal of wrecks could only be accomplished by a suitable Anchor Boat, to which it would be necessary to attach a sufficient Establishment, and as the Committee trusted to me for the preservation of a free passage through the Channel, I visited the Dock Yards for the purpose of procuring a Boat calculated for the purpose. The cost however of an Anchor Boat appeared so exorbitant that I refrained from entering into any agreement with the builders.

For a trifling sum I have been able to purchase and fit up a Country Boat, which proves extremely serviceable, and promises to supersede the necessity of engaging a more expensive Vessel. I have the honor to forward a bill, which includes the original cost of the boat, with a statement of the charges incurred in rendering her useful, which I request you will be kind enough to submit for the sanction of the Committee, and I would recommend that the following Establishment be entertained and attached to the boat from the 1st Proximo:—

1 Serang,	...	...	...	...	Sa. Rs.	7
1 Tindal,	...	...	...	...	...	5
4 Dandies, @ 4 / each	16
Sundries for the use of the Boat,	2

Total	Sa. Rs.	30 per Mensem.
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I have, &c.

(Signed) J. MASTER,
Magistrate.

FOUZDARY AUDALUT,
SUBURBS OF CALCUTTA,
25th August, 1827.

(A True Copy,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 85.

(No. 169.)

TO LIEUT. T. PRINSEP,
Superintendent of Canals.

SIR,

With reference to Paragraph 7th of your Letter of the 28th ultimo, on the subject of the obstructions that have accumulated in Tolly's Nullah, I am desired by the Canal Committee to request, that you will oblige them by furnishing, at your earliest convenience, a full and particular Report on the present state of that passage, mentioning at the same time the measures that you would deem necessary for deepening and improving the Nullah, so that it might become fit for the purposes of Trade and Navigation.

The Committee are also desirous of ascertaining your sentiments, as to whether Dredging Apparatus might not be advantageously employed on this service, particularly at those places where the obstructions are caused by the formation of Sand Banks.

I have, &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
14th September, 1827.

(Signed) J. N. JACKSON,
Secretary, Canal Committee.

No. 87.

(Copy.)

No. 73.

MAJOR JACKSON,
Secretary, Canal Committee.

SIR,

The instructions conveyed in your Letter No. 169, appear to have reference to some expressions in my Report of 28th August last. The particular remark which has called the attention of the Committee to the state of the Navigation of Tolly's Nullah, I conclude to have been the following: "That, as, (when the removal of the old confined Bridge " has had full effect,) the rise and fall of the Tide will increase, and the passage become more " affected by the Tides in the River, it may be expected to become even more limited in its " facilities of Navigation." I will now proceed to detail my views upon the subject, which suggested the remark in question, and at the same time many subsequent observations which appear to confirm my first impressions.

The subject is involved in some considerable intricacy, and can only be treated upon the pure principles of the science of Hydraulics, I hope therefore the indulgence of the Committee, if I limit myself to the general outlines of the case, and refrain from introducing into my Report the more minute calculations, which perhaps would not excite the same interest in those whose avocations do not allow their considering such subjects with equal attention, and which had better remain confined to my own notes.

The Committee are, I doubt not, already aware, that in any running stream, if by

accident or design the Channel be contracted to less than its natural section, the effect of such contraction is to create an artificial elevation of the surface of the water at that place, which elevation extends in a curve to a certain distance up the stream. This elevation is denominated by the writers on the subject, *an afflux*, and the distance to which it extends, *its amplitude*. Dubuat has furnished a formula, from theory and experiment combined, by which this *afflux* may at any time be calculated. Its variation is regulated by the velocity of the stream and nature of the contraction.*

The several affluxes, created by the contractions of the Channel and height of the floors at the several Bridges of Allypoor, Kidderpoor, and Gurryahaut, may be assigned as the chief causes, why the annual and daily variations of the Tide differ so considerably at these several places from the correspondent variations of the Parent Tides in the River Hooghly and Tarda Salt Nullah. It cannot therefore be very difficult to comprehend, how the removal of such causes will have a prejudicial effect in decreasing this difference; inasmuch as it may lower the present levels of the Ebb Tides of the dry months, throughout the passage.

I annex in the margin

Hooglee River.		Kidderpoor Bridge.	Allypoor.	Tolly Gunge.	Gurrya.
Ft. In	Floor or bed under Bridge	+ 0 6	+ 1 7	+ 2 1	+ 1 1
20	6 Annual Variation, ...	+ 18 0	+ 15 8	+ 11 10	+ 8 5
12	5 Daily Var. Sept. Eqx.	+ 11 5	+ 10 2	+ 6 4	+ 3 6
20	6 Highest Water Mark,	+ 19 6	+ 15 3	+ 15 3	+ 11 11
0	0 Lowest ditto,	+ 1 6	+ 2 7	+ 3 5	+ 3 6

what I have deduced as the relative levels and variations of Tide in the different parts of the Nullah, from observation and inquiry.

N. B.— At the mouth of the Kamapookrya Nullah, the floor of the Nullah is as high as + 3 — Here the Tides meet in the dry season, and from hence, in the rains the stream runs continually eastward, towards the Gurrya side.

The levels have not been

compared by actual admeasurement instrumentally, but the principle upon which they have been ascertained, leave very little doubt of their accuracy.

The quantity of water left in the Nullah in its driest state, is found from this Table by comparing the lowest water mark of a place with its floor. Thus at the mouth of the Kumapookrya Nullah, where the floor is at $\times 3$, and the lowest water some 6 inches above that of Gurrya and Tolly Gunge, there remains not more than 1 foot at the lowest Tide, and for the length of 3 miles between Tolly Gunge and Gurrya, not more than an average of 2 feet.

Of the two Tides which flow into this Nullah, that from the Salt River of Tarda is later than that from the River. This cause, combined with the very great afflux at Allypoor and Kidderpoor, is the reason why the Ebb during the dry season remains up at the elevation which has been observed.† Indeed the floor of the Allypoor Bridge, which is 1 foot and 7 inches above lowest water-mark of the River, will always prevent its falling much lower than at present. Remove this cause, and give every facility to the free ingress and egress of Tide from the Hooglee, and I have little doubt that the surface of the water at Tollygunge during the Ebb may, by such increase in the discharge be lowered more than a foot; for this afflux must of necessity have a greater influence in the expenditure of the Ebb than in the influx of the flood: inasmuch, as the ratio of contraction R, (which is a multiplier in the formula,) is in this case the greatest. Indeed the floor of the Allypoor Bridge would act as a retaining dam, if the water within it fell to its own level, which is 1 foot and 7 inches above the lowest Ebb in the Hooglee.

With these remarks before them, the Committee will at once comprehend the difficulty of ever making the passage in question fit for all navigable purposes, at every state of the

* De Haviland's Translation, Part 1 Section 3. Ch. 3.

The equation is $\left(\frac{V^2}{2G} \times p. \right) + (K^2 1)$ where

V = Velocity.

G = Diminished gravity.

P. = Slope naturally.

K. = Ratio of contraction.

† Vide the above Table, the Ebb remains up between 2 and 4 feet above the Ebb in the rains.

'Tide. To secure a sufficiency of water when the present contractions are removed, the bed of the Nullah will equally require deepening in the Kidderpoor and Allypoor division, as at Tollygunge and Gurrya. And if such is ever carried into effect, the superior elevation of the Tide during the Equinoxes of September, which is now depressed by the affluxes at Allypoor and Kidderpoor, (each of which may be taken at 15* inches or more, when the Tide in the River is at the highest,) appear to threaten a rapidity of current and corresponding elevation in the Jheels, which are hence supplied with water, that may occasion injury to private property.

Upon mature deliberation, I am therefore inclined to abstain from recommending the use of Dredging Machinery in this Nullah, as much too expensive, and perfectly ineffective against the evils with which we have to contend; and which exist in the particular nature of the passage. It is also very doubtful, whether, if the bed were excavated by manual labor to the depth required between Tollygunge and Gurrya, it would not fill to its former height in the course of a single season of irruption from the Freshes of the River. The Nullah at present has a less section beyond its junction with the Kamapookrya Nullah, which contracted form extends for many miles beyond Gurrya. This alone would create a check sufficient to cause the turbid waters from the Hooglee to deposit to the former bed, and such cause will remain, until the remote period when the Gurrya Nullah has excavated itself to a sufficient relative section.

I have therefore looked to other means than excavation, to create an additional depth of water in this passage during the dry months at Ebb Tide, and hope to be able to offer a method that shall secure one or two feet more than is at present found at Ebb Tide, and increase rather than diminish the depth of water at Flood Tide. I have chosen in preference to the very expensive plan by Tide-gates, the more simple and economical one derived from the principles of the afflux which I have just enumerated, and the method of application of this principle, which I would suggest, is to create an afflux or several affluxes, against the Ebbing Tide, at the same time that the Channel should remain perfectly free to the flowing Tide.

I do not offer the present as a measure calculated entirely to obviate the difficulties of this passage. It is my opinion, which I have already given elsewhere, that a small Nullah of this kind, into which the turbid waters from the Hooglee are allowed free ingress, can never be expected to remain perfectly navigable throughout the year, at every state of Tide, on account of the very great variation of Tide in the River, and the diminished velocity of the water in such a Channel, which must invite a deposit of all the grosser particles of matter which are held in suspension by the water which is admitted from the River, if no more.

I have here earnestly to recommend the Committee to instruct the persons, I believe Convicts, who are engaged in clearing away the foundation of the Kidderpoor Bridge, and the Officer that may be engaged hereafter in dismantling the Allypoor Bridge, to be cautious how they endeavor to lower the floor of the Channel under these places, and to urge upon their attention this principle; viz. to enlarge the Channel as much as possible in all contracted places above the mean water mark, but by no means to enlarge it below this mark at present. All the enquiries I have made, seem to agree in the fact, that the Ebb, during the last dry season, fell to a lower level than it had been known to fall before, and which I may very fairly place to the account of what had been done at Gurrya, and at Tollygunge and Kidderpoor.

I have drawn up separately the Memoranda in explanation of the method I have thought best adapted to improve the passage in question, and if the Committee upon consideration think it advisable, will proceed to construct one or two of the shutter Dams, by way of ex-

* It would be 15 inches when the contraction or $K=.2\frac{1}{2}$, and the velocity $V=52$ inches per M., or 3 miles per hour

periment, and will report upon the result. The expense will be trifling, 400 Rupees at an average at each place, where it is required to create an afflux. The Navigation will be no wise impeded by them, and in case the method is not attended with the success anticipated, their removal will be easy and immediate. The situations where I consider it to be first necessary, are Gurryahat and Tollygunge, after which I would propose Allypooor.

I have, &c.

CALCUTTA,
CANAL SUPERINTENDENT'S OFFICE,
8th October, 1827.

(Signed) THOS. PRINSEP, *Captain, Engineers,*
Superintendent of Canals.

(True Copy.)

Secretary, Canal Committee.

No. 87 a.

(Copy.)

Construction.

A shutter 10 or 15 feet long, by 6 to 9 feet wide, A. B. swinging upon an axis terminated by two iron gudgeons, *b. b.* strongly affixed to the frame of the shutter at the depth of $\frac{1}{3}$ d or $\frac{1}{4}$ th from the tops. These gudgeons bearing upon the top of one pile *a. a.* which rests against, and is fixed to a longer pile *c. c.* by a mortice and strap of iron, also embracing the gudgeon. A long arm to be fixed to the centre of the shutter, upon which may be hung a counterpoise. A girder rail, *d. d.* to unite the top of the long piles and steady the whole frame by uniting it to the bank of the Nullah.

When the Tide is flowing, the shutter opens by the pressure of water, as shewn by the dotted lines in Fig. 3, and if the Tide has not power to overcome the poise of the shutter, an addition to the counterpoising weight on the arm or level will open it.

The drawing represents the shutters closed against the Ebb, and as the pressure of water is not powerful, the piled framing is quite sufficient to sustain it.

The figures 1 and 2, is an application of this contrivance to the section at the new Gurryahat Bridge. The construction will differ at Allypooor and Kidderpooor, where the variation of Tide is greater, but not very sensibly at Tollygunge.

(Signed) THOS. PRINSEP.

(True Copy.)

J. N. JACKSON,

Secretary, Canal Committee.

No. 89.

(Copy.)

No. 78.

TO MAJOR J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

SIR,

As the late orders of Government will put it in the power of the Committee, shortly to enable me to prepare the ground for the Ooltadanga or Circular Canal, I have thought it opportune to submit the accompanying Memoir and Plate regarding its scheme of construction, in order that the subject may have full time for consideration, before the actual commencement of excavation.

The introduction of Gates into the system of Navigation of this Country, which has hitherto been conducted upon such crude and unscientific principles, may at first view appear as unnecessary an innovation into the old established routine, as at one time the introduction of steam was considered, on account of the low rate of labour : and I can scarce anticipate the immediate and unqualified reception of the accompanying scheme without some preliminary discussion.

The chief advancement upon former principles of Navigation in the Delta, contained in the scheme of my predecessor, is comprised in his exclusion of all turbid water from his Canals, which might be introduced from the Freshes of the different subsidiary mouths of the Ganges. By the introduction of Tide Gates, I have gone one step further to secure them from the great variations of Tide, which are found in those streams, and when I recur to the observations I had the honor lately to submit, concerning Tolly's Nulla, I am led to conclude, that a system of Tide Gates will be found in the end, both the least expensive and only efficient method of preserving the constant Navigation of any small Canal or Stream, which desembogues into a large Tide River, exhibiting so very great daily as well as annual variation of surface, as the Hooglee.

I beg therefore to express my perfect acquiescence, in any measures that the Committee may think it advisable to take, in order to procure the opinions of other Officers more conversant in the subject than myself, and have with all due diffidence in my own judgment, to request, that I may be allowed to reconsider any part of the subject, which on discussion may appear not sufficiently demonstrated, before any alteration is decided upon finally, in consequence of opinions thus received.

I have, &c.

CALCUTTA,
CANAL SUPERINTENDENT'S OFFICE,
31st October, 1827.

(Signed) THOS. PRINSEP, *Captain, Engineers,*
Superintendent of Canals.

(True Copy,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 89. a.

(Copies.)

Memoir upon a Design for Improving the Construction and Management of the Circular Canal of Communication, between the River Hooglee and Salt Water Lake, as sanctioned upon the proposition of the late Major J. A. SCHALCH in his printed Memoir, submitted to the Canal Committee by Lieutenant PRINSEP, Engineers.—October 1827.

1. In the Second Appendix to Major Schalch's printed Memoir, containing his proposal of a design for improving the Navigation of the Delta of the Ganges, that enlightened Officer's views and calculations are fully detailed regarding the intended disposition of the Circular Canal of Communication between the River Hooglee and Salt Water Lake, a part of the extensive undertaking, comprised in that Memoir, upon the feasibility of which most doubt was entertained ; and from which if successful, the greatest profit and advantage were anticipated.

2. The calculations and remarks in that Appendix, were called for, to allay certain apprehensions entertained by many Members of the Special Committee, before whom the subject was submitted, of great inconvenience, if not imminent danger to the City of Calcutta and environs, from allowing the waters of the Hooghlee unrestrained ingress into the Lake, the extreme difference in their surfaces being known to reach 12 feet in the rainy season.

3. The principles upon which those remarks have been founded, as well as the general tenor of the conclusions drawn from the different calculations are correct, with some few exceptions. The deviations from the original scheme, therein contained, which I am now about to suggest, will I trust, be considered as proceeding from a more mature consideration of the subject, and I shall be fully content, if they are examined strictly upon the identical principles originated by the author of the Memoir.

4. I will in the first place describe in outline, the Plan proposed in the Memoir, and sanctioned by the Supreme Government for the construction of the Circular Canal, and the principles upon which the scheme was founded. After which, I will proceed to detail my own views upon the different points, and my reasons for substituting the annexed design, in preference to the simple method proposed by my predecessor.

Major SCHALCH's Design.

5. A Canal to be excavated from Chitpore to the present Eastern Canal, at a point East of the Koolya Bridge; the total length, 19,500 running feet, equal to $3\frac{1}{10}$ miles. The breadth at low water to be 90 feet, and depth 7 feet; average depth of excavation 23 feet, mean breadth 108 feet.

6. The part of the Eastern Canal from the junction to the Lake to be deepened, level with the bottom of the New Canal, and embankments to be formed in the Lake itself, so as to secure a length of Canal from Chitpore to the point on the Lake, where the water will be allowed to spread, of 7 to 8 miles.

7. The bottom of the Canal being fixed at 7 feet below low-water mark in the Hooghlee, would thus be 14 feet below Zero, or the average surface of the Lake.*

8. It was observed, that at the highest state of the River Tide in September, the slope of the water in the Canal would reach 12 feet, to be divided over a length of 7 miles; and in April and May that it would occasionally amount to 8 feet. The velocity expected in the former case was $3\frac{3}{4}$ miles per hour, in the latter case $2\frac{2}{10}$ miles per hour, from which velocity, the writer apprehended little or no danger to the banks of the Canal, as the duration of such velocity could not be very long.

9. The levels at which it might be expected that the water in the Canal would remain at the different points, where the Drains of the City would have their exits, threatened such inconvenience to the Drainage; added to the fear of the choaking of the Canal from the Sand and Silt derived from the turbid waters of the Hooghlee, that the projector at once abandoned the idea of allowing the communication to remain open during the entire year. He says, "The stability of my other Canals is built entirely upon their not being exposed to the Freshes of the River."

10. With this view, he therefore proposes an economical and simple method of closing the communication for 3 months of the year, a drawing of which is annexed to the Memoir in Plate II. fig. 2. The method is derived from what Belidor and other authors describe as

* The average surface of the Lake being taken as Zero, or the base of the system of levels, the extreme low-water mark of the River Hooghlee is found $7\frac{1}{2}$ feet below it. The excavation, if carried $6\frac{1}{2}$ feet below this, will be 14 feet below Zero.

being used in the Fortresses of the Rhine and Netherlands, to stop the running water of a River, and create at pleasure an inundation of the Country around its glacis, of any extent or depth.

11. Farther, as it was an acknowledged disadvantage to close all communication with the Canal, which he denominates a Harbour to the City, Major Schalch proposes that this artificial Dam should be placed at the intersection of the Dum-Dum Road; thus leaving the remaining portion of the Canal towards the River, to act as a safe retreat from the dangers of the River.

12. In the above Sketch, is comprised all that has been offered by Major Schalch upon the subject of this Canal; with the exception of a method of guarding against all possibility of failure, in excavating to the required depth, from the occurrence of a Stratum of Ooze and Sand, a Sketch of which is annexed, Plate II. fig. 1.

13. In preparing the accompanying design, my object has been to unite economy with utility; and although I have perhaps, by substituting a system of Gates for the Sleeper Dams, departed from the simplicity of design, so much the aim of the original projector, I should hope that the advantages to be obtained by such application of scientific principles, will not be thought too trivial to be purchased even by a small addition to the Outlay.

When, however, I can demonstrate to the conviction of every unbiassed judgment, that this substitution will, instead of adding to the expense authorised for the work, rather create a saving; besides obviating many difficulties that appear likely to endanger the success of the undertaking as at present constituted, I should humbly conceive that the mere objection of want of simplicity, cannot for a moment deter the Committee from recommending its adoption to the favorable consideration of the Supreme Government.

14. I will proceed to state, the chief difficulties and objections which may be urged against the present design for the Circular Canal.

15. *First.* With regard to the depth to which it will be necessary to carry the excavation, from 25 feet to 19 feet, or average 23, the different wells sunk for the purpose of examining the Substrata, have pointed out the existence of a Stratum of Oozing

	Ooze.	Blue clay.
* Balyaghat Road, depth	18	feet to 21
Raja Ram Lochun's Road, „	22	feet to 27
Manicktolla Road, „	25	not pierced to clay.
Saum Bazar, „		No sand.
Chitpooor Cross Road, „	19	feet to 25½
Baug Bazar, „	21	feet to 23

Sand at the various depths of 18, 22, 25, 19,

21.* The elevations of the Road opposite these several points are respectively, about 7, 8, 8, 14, 18 feet above the average surface of the Lake, or Zero. The excavations agreeable to the design, will

therefore be respectively, 21, 22, 22, 28, 32. In all these cases but one, will the Stratum of Oozing Sand be touched, and in the latter two, the excavations will have to be carried much below it.

16. *Secondly.* It has been found impracticable to construct the embankments in the Lake, and Major Schalch himself has already proposed their abandonment in his Report of the operations in 1823-24. The distance over which the fall of water has to be divided, will thus be reduced from 7 to $5\frac{1}{2}$ miles. The correspondent increase of velocity of the April fall of 8 feet, now become 17 inches per mile, will be $3\frac{4}{10}$ miles per hour, instead of $2\frac{9}{10}$, or within $\frac{1}{2}$ mile of what was calculated for the extreme case of 12 feet fall.

17. On this point, of the effects of such current upon the bed and banks, I apprehend, they are much underrated in the Memoir. The experiments of Dubuat upon the subject, would assign a much more considerable power of corrosion to such a current. The remarks and observations of Major Schalch on the Current in Tolly's Nullah, are far from conclusive, and it does not appear that he has at all considered the effects of the obstructions created by Bridges upon the phenomena of the Tides, or the deposit of Silt. In that part of the Nullah, East of Gurriahat, where all obstructions of the kind cease, and where the Canal ap-

pears to be in what is called by Dubuat, *perfect regimen* ; * both the velocity and fall is always less than that stated by Major S. as observed, and no deposit of any consequence appears to take place.

18. The greatest velocity of Current in Tolly's Nullah happens when the water enters from the Hooghlee, so overcharged with sand and clay, that it would be quite incapable of holding in solution or even suspension, any thing beyond what it already carries ; and might indeed be expected rather to deposit what it holds, than to excavate the bed and banks of the Nullah ; as the velocity in the Nullah is less than in the River.

19. It was the intention of the author of the Memoir, to construct the several Bridges, over the New Circular Canal, that little or no obstruction might be offered to the free passage of the Current ; and with this view, no allowance has been made in the calculations, relating to the expected fall and velocity for such impediments.

20. In Tolly's Nullah, before the removal of the old Kidderpore and Tolly Gunge Bridges, the effect of the obstruction may be somewhat conceived in its influence upon the phenomena of fall and velocity, when I mention, that (by actual observation) while in the Hooghlee River, the extreme annual variation of the Tide amounted to $20\frac{1}{2}$ feet, at Gurryahat, a distance of nine miles by water, the extreme annual variation did not exceed 7 feet. An alteration in the Tides of this Nullah since the construction of the Suspension Bridges is already very sensible ; and it is easy to foresee much greater alteration upon the entire removal of the old foundations of the Kidderpore Bridge, and when the Allypore Bridge is likewise removed for a Suspension Bridge of the same kind.

21. I should therefore consider, that it is scarcely safe to weigh the future success of the scheme upon any observations collected from the phenomena of Tides in the Nullah in question, until it has assumed a perfect regimen under the new order of things ; which will obtain when Suspension Bridges are constructed in place of all the old timber ones. And I should incline to the opinion, that the author of the Memoir has far underrated the effects of wear and tear to be anticipated, from the unrestrained passage of Tide-water, which he has proposed. The extreme velocity of Current which could be at any time desired to run through the Canal, either for the purpose of cleaning it from rubbish, or for the facilities of Navigation, cannot be more than two miles per hour. I should estimate it even less, and it is of the highest importance that all water, which is introduced from the River, should be clear from Sand or Silt.

22. The next point upon which I have to offer any remarks, is the variation of the surface of the water in the Canal into which the City Drains will still be conducted. His views upon this subject, chiefly influenced my predecessor in the determination to close the Channel during the months of July, August, and September. It appears to me, however, that the same inconveniences will occur in April, May, June, and October ; for, during these months the Tides rise inconveniently high during the Springs, and heavy rain very frequently falls. If by any chance during the Springs, heavy rain should fall while the Tide was rising in the Canal, (by no means an improbable case,) the running off of the rain water from the Streets of Calcutta, would be delayed full six hours.

Further, the average flood level opposite the main Dhurumtullah Exit-drain, during these months would be more than 2 feet above θ Zero, the extreme flood level being nearly 5 feet at the least. The present Sill of that Drain is 2 feet and 1 inch above Zero, so that on many occasions the Tide Water would flow up the Drains, in times when much rain may be expected to fall.

* *Perfect regimen*, is a term used by Dubuat and his translator De Haviland, denoting that state of a Conduit Pipe or Canal, when the velocity and slope have assumed an uniformity throughout the length, proportional to the Section, and when the Bottom and Banks no longer appear to alter their form from corrosion or deposit.

23. Major Schaleh has, I fear, in proposing to close the communication for any period, valued the advantages of the passage too lightly, nor

* Year 1822 and 23. Number of Boats.

January,	997
February,	1,205
March,	1,018
April,	884
May,	829
June,	1,127
July,	538
August,	645
September,	813
October,	849
November,	879
December,	841

does the account* obtained from the Collector's Books for 1822-23, at all warrant his supposition of so great difference in the thoroughfare for these months. If, however, it is at all expected, either that the traffic by the Eastern or Sunderbun route, will increase upon the improvement being completed, or that the superior advantages of the New Canal will attract the most of the Trade which now passes through Tolly's Nullah, such stoppage of the Canal, cannot but be considered as a very great sacrifice.

24. This point, however, which does not in any way relate to the Engineering part of the undertaking, will be much better understood by the Members of the Committee and Officers of Government, who are concerned in the collection of Revenue, and I therefore refrain from any further remarks upon the subject.

25. The only remaining point upon which I have to object, is the nature of that portion of the Canal which Major Schaleh has left, as a bason of shelter from the dangers of the River. Westward of the Timber Dams across the Saumbazar Road, it is left subject to the gradual flux and reflux of Tide under the worst possible circumstances, when the water which will flow into it, is overcharged with Sand and Silt of the most gross kind. It will not possess in itself any means of scouring the sediment caused by the stagnation of every Tide, while the Dams are closed ; nor at the end of the season when the Dams are raised, can any sufficient rush of water be brought to bear upon it, that would excavate all the accumulated sediment of these three months. Indeed it might be apprehended, if a scouring force could be applied, that the rest of the Canal and Lake would suffer in consequence.

26. I have thought it unnecessary to consider what would be the effect upon the level of the Lake, by the free admission of Tide proposed in the Memoir. It is a point very difficult to reduce to any thing beyond speculation. There is, however, quite sufficient reason to suppose, that great alteration would take place in its Tide phenomena, and that such alterations might tend disadvantageously upon the present system of Draining the Town.

27. Having now enumerated the principal difficulties and objections which occur to me, as likely to attend the construction of the Circular Canal, sanctioned upon the proposition contained in the printed Memoir, I will proceed to detail the principles upon which I have framed the annexed design, in order that the Committee may judge upon the comparative advantages of the two methods, and after mature consideration, determine which may be most worthy of adoption.

28. The basis of any consideration, upon the junction of two Tide Waters must necessarily rest upon the accuracy of Tide Registers, kept even daily. I have myself kept a daily Register of the Tides in the Eastern Canal, by a gauge fixed on the Masonry of Koolya Bridge. For those of the River I am indebted to the very valuable and elaborate Registers of Mr. James Kyd, for whose liberality and readiness in allowing me every access, I cannot refrain from expressing my grateful acknowledgment.

29. I have annexed an abstract from the two Registers, upon *which the greatest* reliance may be placed.

30. The advantages which I propose to secure by the substitution of Tide-gates, instead of the very unscientific and imperfect method of Damming up the passage, as suggested in the Memoir, will I trust obviate most, if not all, of the objections which I have enumerated above.

31. The saving of 4 to 6 feet, in the depth of excavation, will, in most cases, save the necessity of piercing the stratum of Oozing Sand; besides the great saving in the expence of digging.

32. The Canal and Lake is secured from any possibility of danger or alteration, either from the rapidity of current, or influx of Sand introduced through the Canal.

33. The facility of Draining the Town, instead of being endangered, will be increased. As the admission of River Water, and its velocity and fall, will be entirely under controul, and may be regulated by the manœuvring of the Water Gates; not only will the chance of the Canal being choaked with Silt from the River be obviated by closing the Gates whenever the River Water is turbid, but the means will be afforded of introducing a current of clear water, nearly fresh, which will add to the salubrity of the vicinity of the Lake, and clear any Silt or Rubbish which may accumulate in the Canal, thus obviating the causes of failure of the present Eastern Canal from stagnation.

34. The adoption of this method of artificial Navigation will secure a daily intercourse with the River throughout the year. The water, from not being allowed to ebb back into the River, will remain sweet* even to the Lake. A secure floating Dock, with 8 feet water at the lowest, will be gained at a trifling expence, in which even Sloops, (rigged,) may take shelter, if one of the Outer Bridges be made to lift or to turn, as in the London Docks. And the general management and Navigation of the Canal, from the gentleness of the current, will be in every respect, superior to what it would be, were the Canal subject to the great variation of Tide which exists in the River.

35. In conducting all works of such nicety and extent, many unforeseen circumstances occur, to alter the details of construction first proposed, and many improvements suggest themselves in its progress. The Plan I have submitted to the Committee, will I trust, be considered as sufficiently explanatory of the general outlines of the construction best adapted to the work, and of the disposition and management of the Gates.

36. I have annexed comparative Estimates of the excavation of the Canal upon the two different designs, likewise particular Estimates of the expenses of the system of Gates, with their Masonry and Bridges, with a general Estimate of the expenses of the Circular Canal according to the new design, compared with what has already been sanctioned for this part of the great undertaking which has been entrusted to my charge, and I have now only to await the period, when the Committee have themselves taken the subject into their serious consideration, when if any part of the subject appears to require any more elaborate explanation, I have only to state my readiness to enter into calculations and discussions, which I have thought beyond the province of a mere Memoir, like the above.

(Signed) THOS. PRINSEP, *Captain,*
Engineers.

Scheme.

First. The general direction of the Canal, between the River at Chitpoor and Eastern Canal, to remain the same as already laid down in the large Survey Plates, prepared by Overseer Turner, under the direction of the Canal Committee; the depth of the Canal to be 8 feet below the average surface of the Lake, instead of 14 feet, the breadth at that surface to be 90 feet, as in the Section fig. 6.

* It is not meant here that the water will be sufficiently sweet to drink, but comparatively sweet. The water in the Hooghlee, from whence it will be derived, is never so brackish that it cannot be used at Low-water, and is palatable at High-water till March, except in the Spring Tides.

Secondly. Four of the Suspension Bridges proposed in the Original Scheme to remain as projected. The fifth to be converted into a system of Tide Gates, as described in the accompanying Plate, and to be placed at the intersection of the present Chitpoor Road, the direction of which, in the immediate neighbourhood of the Gates, to be altered to form a convenient and handsome approach.

Thirdly. Between the Tide Gates and the first Suspension Bridge, at the intersection of the Upper Barrackpoor Road, the Canal to have larger dimensions and depth, in order to form a Basin or Reservoir, in which Crafts may conveniently remain secure from the dangers of the River.

No. 89. *b.*

Manœuvring of the Gates.

1. The sill of the Chamber of the Gates, is made even with the bottom of the Canal, 8 feet below 0 Zero, or Major Schallch's average Surface of the Lake, and 9 inches below the extreme Low-water mark of the River Hooghlee. The two outer pair of Gates (pointing outwards) to be $21\frac{1}{2}$ feet high, 1 foot more than the extreme annual rise and fall in the Hooghlee. The inner pair of Gates to be 14 feet high, pointing inwards. The breadth between the cheeks of the passages to be 24 feet, which will be found sufficient for the largest Boats.

2. The working of the Gates when all are free, on their hinges, will be thus :—

3. When the Tide commences to Ebb from the Canal towards the River, the Inner Gates will, of themselves, close, and prevent any fall of water or communication with the River.

4. When the Flood Tide again has risen to the level of the water in the Basin, which, in the interim, has lowered itself since the Inner Gates closed, by the passage of its water to the Salt Lake, the Inner Gates will open of themselves, and the Outer Gates close of themselves.

5. As however the closing of one set of Gates immediately on the opening of the others would leave no time for the passage of Boats, it is my intention to have the means of fastening the Gates back for any time, or indeed a whole Tide, when it is safe ; reserving the power, in case the stream should become too rapid for the safety of the Canal, of closing them, and diminishing the flow of water at any time while the Tide is flowing.

6. It is proposed to leave the inner pair of Gates, which point against the Ebb, always free to work of themselves, and to regulate the outer pair according to the state of the Tides in the River. To affix a gauge to the Gates themselves, or the masonry of the pier, and instruct the Overseer, (Native or European,) to set the Outer Gates free whenever the water rises to a certain mark, which will, I believe, be found to be near the mark, 6 feet above Zero. The regulation of this cannot be a difficult matter, nor at all beyond the capacity of a Native Peon or Classie.

7. An examination of the account of Tides in the annexed abstract from the Register will shew, that for the months of December, January, and February, the Outer Gates may remain entirely fastened back or even be unswung for repair, and that at the lowest state of the Flood Tide, the Inner Gates will be open for two to three hours, if not more. During the months of October, (the latter half,) November, March, April, and May, that the height of the Tides will allow of the Outer Gates being fastened back for the whole of the Neap

Tides, their closing being only necessary for the few days of Spring Flood; and that for the four remaining months of June, July, August, and September, it will still be possible to secure a communication daily for several hours, there being very few occasions when the Ebb in the River remains above what will be the level of water in the Basin and Canal.

8. As a safeguard against any accident or failure of the Outer Gates, when the River is at the highest, I have introduced grooves behind the Gates, such as are found in the descriptions of the system of Tide Gates, so much admired, connecting the Port of Ostend with the Canal of Bridges; and as the timbers will be ready at hand in the cell, which I have proposed to construct for the purpose of containing them in the Masonry of the Abutments, all danger may be prevented at the shortest notice, by lowering these timbers into the grooves, an operation that cannot occupy many hours.

Construction.

9. As the foundations of the Pier and Abutments sink below the bad stratum of Sand, after which I have found a solid dark blue clay, I have, instead of timber, drawn an inverted arch of brick under the Gates, to form the flooring of the passage. This construction will be found more durable, and less expensive. Immediately in the bearing of the Gates, a strong frame of timber, (leak,) must be imbedded in the Masonry.

10. The Bridges over the passages, I have drawn of the simplest and most economical nature. If, however, it is thought worth the additional expense, Draw or Swing Bridges may be substituted, by which means, Pinnaces or Boats of any description, may pass into the Basin with their masts and rigging.

11. I have not inserted in the Plate, either any Culvert in the Masonry of the Piers or Hatches to any of the Gates. It may, however, be an improvement to construct something of the kind, in order to obtain a means of clearing the aprons of the Gates at Low-water.

(Signed) THOS. PRINSEP.

(True Copy,)

J. N. JACKSON,
Secretary, Canal Committee.

No. 89. c.

Estimate of the probable Expense that will attend the construction of Tide Gates and Bridges, according to the Plan described in the accompanying Plate

To Excavating in quantity, 500 Chowkas at 2/8,	..	..	..	Rs. 1,250	0	0
„ Expenses in raising water, puddling against the Oozing Sand Stratum, and keeping the work constantly dry, estimated at most,	..	..	..	5,000	0	0
„ Superstructure in Abutments and Pier, containing on measurement 63,600 cubic feet, at 20 Rs. per 100 feet,	..	..	..	12,720	0	0
„ Foundations with inverted Arches, containing on measurement 24,600 cubic feet, at 25 Rs. per 100,	..	..	..	6,150	0	0
„ Coping Stones, Chunar, 9 inches thick, in all 557 cubic feet at 2 Rs.,	..	..	..	1,114	0	0
„ 118 Running feet of Iron Rail, plain, at 5 Rs.,	..	..	..	590	0	0
„ Four Iron Lamp Posts complete, at 100 Rs. each,	..	..	..	400	0	0
Expenses of 2 plain Wooden Bridges of 28 feet span.								
18 Large Saul Beams, at 60 Rs. each,	..	1,080	0	0				
18 Lower to upper,	..	1,080	0	0				
1,364 Square feet Planks, at 12 annas,	..	1,023	0	0				
124 Running feet Wooden Rail,	..	200	0	0				
					3,383	0	0	
„ Expense of two outer pair of Gates, 21½ feet high, 15 feet wide, each door with timber grooves and aprons, brass coppered,	8,000	0	0			
„ Expenses of two inner pair of Gates, 14 feet high, 15 feet wide, &c. and complete,	5,000	0	0			
„ Expenses in Road-way of approach, &c.	2,000	0	0			
„ A Culvert in centre Pier if necessary, with draw hatches, or otherwise a hutch in gates,	500	0	0			
„ Three neat Windlasses or Crabs to the Outer Gates,	600	0	0			
„ Ditto ditto for Inner Gates,	600	0	0			
„ 80 Saul Timbers to fit grooves at 50 Rs. each,	4,000	0	0			
Contingencies, Supervision, &c.	8,693	0	0			
						60,000	0	0

(Signed) THOS. PRINSEP, *Captain, Engineers.*

(True Copy,)

J. N. JACKSON,

Secretary, Canal Committee.

General Estimate for the probable Expenses attending the construction of the Circular Canal, agreeable to the Scheme proposed by Major SCHALCH in the Memoir and Appendix.

General Estimate for the probable Expenses attending the construction of the Circular Canal, agreeable to the Scheme now proposed by Lieutenant PRINSEP, Engineers.

Excavating 17,100 running feet of Canal.

Average depth 22x mean breadth 108=2376 Section= in all 4,06,29,600 Cubic feet, or 55,733 Chowkas, @ 2 Rs. ..	1,11,466 0 0
Excavating 2,000 running feet of Basin, containing 11,105x1,448=12,553 Chowkas, @ 2 Rs. ..	25,106 0 0
Ditto from Basin to River, containing 1,029 Chowkas, @ 2 Rs. ..	2,058 0 0
Total Excavation, ..	1,38,630 0 0
Add. Estimate for 5 Bridges, @ 20,000 each, ...	1,00,000 0 0
Add. Ditto for Road, &c. ...	60,000 0 0
Add. Extra Expense for Sleeper Dams, omitted in Major Schalch's Original Estimates, ..	5,000 0 0
	Sicca Rupees 3,03,630 0 0

Excavating 17,100 running feet of Canal.

Average depth 16x mean breadth 90=1,440 feet Section, in all 2,46,24,000 Cubic feet, or 33,777 Chowkas, @ 2 Rs. ..	67,554 0 0
Excavating 2,000 feet of Basin, containing 11,105 Chowkas, @ 2 Rs. ..	22,210 0 0
Ditto from Basin to River, 1,029 Chowkas, @ 2 Rs. ..	2,058 0 0
Total Excavation, ..	91,822 0 0
Add. Estimate (old) for four Bridges, ..	..
Add. ditto ditto for Roads, ..	..
Add. ditto for Tide Gates, ..	..
	Sicca Rupees .. 2,91,822 0 0

NOTE.—The average rate of excavating is here assumed to be 2 Rs. per Chowka. I should question whether it could be excavated under average 2/8, and as the extra depth of 6 feet will influence this average, the rate of Major S's Scheme should be 2/12, where Lieutenant P. is 2/8, and the two first items become, 1,90,616 4 0 and 1,14,777 8 0

3,55,616 4 0 3,32,324 8 0

(True Copy,)

(Signed)

J. N. JACKSON,

Secretary, Canal Committee.

THOS. PRINSEP, Captain.

No. 90.

No. 203.

To H. T. PRINSEP, ESQ.

Acting Secretary to Government, Territorial Department.

SIR,

I have the honor, by desire of the Canal Committee, to transmit for the consideration of the Right Honorable the Governor General in Council, the Copy of a Letter and Memoir, with a Plan in original, submitted to them by Captain T. Prinsep, Superintendent of Canals, dated the 31st ultimo, on the subject of the proposed Canal of Communication between the Hooghly at Chitpore and the Balliaghaut Canal, and suggesting certain alterations in modification of the Plan of that work, as prepared by the late Major Schalch.

In the judgment of the Committee, the Memoir contains much important and valuable information; but as the proposed deviations from the Original Plan sanctioned by Government are very considerable, although the aggregate amount of expense will not thereby be increased, they are induced to refrain from recommending the immediate adoption of Captain Prinsep's suggestions, conceiving it probable, that Government may deem it expedient to refer the subject to such other Officers at the Presidency, as may be qualified to offer their opinions upon it; such a proceeding would prove satisfactory to the Committee, as well as to the Superintendent, Captain Prinsep, who has expressed his entire acquiescence in the measure.

I have the honor to be,

Sir,

Your most obedient servant,

J. N. JACKSON,

Secretary, Canal Committee.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
19th November, 1827.

No. 93.

To MAJOR J. N. JACKSON,

Secretary, Canal Committee.

Revenue, 6th December, 1827.

SIR,

I am directed by the Right Honorable the Governor General in Council, to acknowledge the receipt of your Letter, dated the 19th ultimo, submitting a Memoir from Captain Prinsep, Superintendent of Canals, on the proposed Canal between the River Hooghly and the Salt Water Lake; and suggesting certain alterations in modification of the late Major Schalch's Plan.

2. Though on the whole favorably disposed to the alteration of [the] Plan suggested, which seems to be founded on correct principles and calculations, His Lordship in Council, nevertheless entirely concurs in the expediency of consulting other professional persons before finally determining on a point of so much importance to the success of the work, as the proposed attempt to use sluice gates at the Point of Communication with the River.

3. His Lordship in Council accordingly desires, that you will consult with such Engineer Officers as you may consider best qualified to give a sound opinion on the subject,

and likewise that you will solicit information from such other persons, as from having been engaged in Superintending or Constructing Docks and Tide Gates for Shipping, you may deem competent judges of the practical parts of the Plan brought forward by the Superintendent of Canals.

4. It may be advantageous in many respects, and will assist the Governor General in Council, in forming a clearer perception of the questions involved, that your Committee should frame a series of distinct interrogatories to be submitted to the persons whom you may deem it proper to consult, and these with the answers, you will of course submit, together with your own sentiments on the most material points ultimately referred, for the determination of His Lordship in Council.

5. The original Plan which accompanied your Letter, is herewith returned.

I am, &c.

(Signed) H. T. PRINSEP,
Secretary to Government.

No. 94.

No. 1845.

To MAJOR J. N. JACKSON,

Secretary, Canal Committee.

SIR,

I am directed by the Right Honorable the Governor General in Council, to transmit for the information of the Canal Committee, the subjoined Extracts, (Paragraphs 87 to 91,) from a Dispatch from the Honorable the Court of Directors, under date the 11th July, 1827.

I am &c.

COUNCIL CHAMBER,
The 13th December, 1827.

(Signed) H. T. PRINSEP,
Secretary to the Government.

No. 94. a.

Extract from a General Letter from the Honorable the Court of Directors in the Revenue Department, dated 11th July, 1827.

228 to 259. Proceedings for investigating and carrying into execution Lieut. Schalch's Plan for opening a permanent communication between the Hooghly and the great River. Formation of a Committee to investigate and controul. Proposal entertained for making a Navigable Cut from Calcutta to Channel Creek. Purchase of a Steam Engine for Excavating Canals. The Eastern Canal to be cleared at the expense of Rs. 9,785, and a temporary Bridge of Iron to be erected at Rs. 1000. A Suspension Bridge to be thrown over Tolly's Nullah at an expense of 39,975. Rs.

87. The idea of the first of these undertakings, that of forming an improved communication between the Hooghly and the great River was previously communicated to us, and the Plan held out the promise of so much advantage, that we expressed an opinion favorable to the design of fully investigating the project. From the voluminous documents before us, we have the satisfaction of perceiving, that you took such measures as appear to us to have been the most effectual in your power for securing the due performance of the investigation by the formation of a Committee, who appear to have

carefully examined the statements and reasonings of the projecter, and called for information on every material point from all such quarters as were presumed the most likely to afford it. The evidence which was thus brought before you, justified in our opinion, the conclusion which you derived from it, that the undertaking was expedient, and the advantage likely to afford compensation for the expense.

88. We agree with you fully in the principle, that to afford the means of cheaper communication is one of the greatest services which can be rendered to the community. And it is only necessary by just calculation to ascertain in the case of any project, that the expectation of creating cheapness is well founded, for as the cost incurred is the cost of the community, unless the annual benefit is more than equal to the interest of the expended Capital, the hope of greater cheapness is not fulfilled. The cost of this undertaking you calculate will be covered, including the charges of Superintendence, by 10½ Lacs of Rupees. And you express a confident expectation, that such Tolls as will be cheerfully submitted to by the Mercantile Community, will not only yield the interest of this sum, but a much more favourable result. We agree with you, that is the proper test of the expediency of such an undertaking, as what the community voluntarily pay for an accommodation, will at any rate not be greater than the advantage it affords them.

89. As one of the difficulties attending the execution of public works on a great scale, is to prevent the misapplication of the funds through negligence or incapacity, as well as fraud, we much approve the care you seem to have bestowed on this material object, by the formation of a Committee of Control,* under whom the Superintending Officer is to execute his duties, and through whom the correspondence with Government is to be carried on; the care of Government will be limited to the duty, but that a very important one, of infusing the due spirit of vigilance into the Superintending Body, and taking care that it is properly maintained.

90. While you were engaged in the inquiries relative to this important work, another of a similar kind, was suggested to you; first by a communication from Mr. Wood, and afterwards by a Plan and Estimates from Lieutenant Schalch, for making a Navigable Cut from Calcutta to Channel Creek. The reflections which we have offered on the preceding Scheme, apply so exactly to this undertaking, that it would be superfluous to repeat them. The circumstances laid before you in evidence, seemed sufficiently to establish the utility of the measure, the cost of which you have limited to 5 Lacs of Rupees. The conduct of this work is put under the same management as the former, and we think with every prospect of a favorable result.

91. The arrangements you made with respect to establishments; the purchase of a Steam Engine for Dredging, which was to be obtained on favorable terms; the disbursements authorized for deepening Tolly's Nullah and the Eastern Canal; and for constructing the requisite Bridge, seem entitled to approbation, and we are unwilling to lengthen this Despatch by observations which you may anticipate on certain parts of the detail. In concluding the subject, we trust, that the interruption which this and other public works may have suffered from the War, has been so managed, as that they may be resumed without intermediate damage, and the consequent waste of any part of the funds which may have been previously expended.

A True Extract,

TERRITORIAL DEPARTMENT,
The 13th December, 1827.

(Signed) H. T. PRINSEP,
Secretary to the Government.

* Consisting of 2d Member of the Board of Revenue, the Superintendent of Police, the Judge and Magistrate of the Suburbs of Calcutta, and the Superintendent of Buildings in the Lower Provinces.

No. 95.

(Copy.)

(No. 1456.)

To MAJOR J. N. JACKSON,

Secretary to the Canal Committee.

SIR,

I have the honor to acknowledge the receipt of your Letter, No. 18, of the 7th ultimo, with its enclosure, except the Plan alluded to, which may perhaps be on its way by Dawk Banghy, and if so, not likely to arrive for a month; yet, in its absence, I have endeavoured to answer the questions put, with reference to the ideas I have formed of the Plan from the description, but my experience connected with the Canals in this part of the Country bears but little on the cases put, and my answers are chiefly mere opinions, which a more intimate acquaintance with the subject, localities, &c. further enquiries, necessary if I had to do the work myself, might cause me to alter, they must consequently be received with this impression.

I have, &c.

DELLEE CANAL OFFICE IN CAMP,
SHAHPOOR,

10th March, 1828.

(Signed)

JOHN COLVIN, Captain,

Superintendent of Canals, Dellee Territory.

(A True Copy.)

(Signed)

J. N. JACKSON.

No. 95. a.

[*Questions put by the Committee appointed to control and direct the execution of Lieutenant SCHALCH's Plan of a line of Canal from the River Hoogly to Koolna, to Captain JOHN COLVIN, Superintendent of Canals, Dellee Territory, with his Answers thereto.*]

Question 1. Allowing the correctness of the statement of the variations of the Tides in the River and Salt Lake annexed to the Memoir of the Superintendent of Canals, whether it is your opinion that the preference should be given to a system of Tide Gates in managing the communication between the two levels, or to a free ingress and egress of the Tides for the (9) nine months, November to July, putting aside the question of dangers, inconvenience to the Drainage of the Town, or wear and tear of the Banks of the Canal, and merely considering the relative advantages of Navigation in a Canal preserving nearly an even level of surface and gentle (or perhaps no) Current of Water, or in a Canal where the variation of surface and rapidity of Current are considerable?

Answer. In answer to the question as stated, I have no hesitation in giving my opinion in favor of the system of Tide Gates, over that of an open communication for nine months in the year, but I think Tide Gates alone will hardly fully ensure the passage all the year round.

Q. 2. Whether you consider that the principle laid down by the Superintendent in the accompanying Letter, "that a system of Tide Gates will in the end be found both the least expensive and only efficient method of preserving the constant Navigation of any small Canal or Stream, which disembogues into a large Tide River, exhibiting so great

daily, as well as annual, variation of surface as the Hooglee," appears in your apprehension to be founded in truth?

A. I would say, the only efficient method of securing the constant Navigation would be a combined system of Tide and Lock Gates, as appears to me to be adverted to by the Superintendent in the article headed "Manœuvring of the Gates," Paragraph 1; although the Estimate provides for only one pair of Outer, and one pair of Inner Gates.

Q. 3. From your experience in founding Buildings of a Hydraulic nature, whether you conceive there to be any insuperable difficulties against the execution of the present design, and whether you conceive the objections offered by Major Schalch in his Appendix, Page 13, Paragraph 11, "Whereas Flood Gates not only requires the most scrupulous adjustment of their parts, but a degree of evenness of Floor, which can hardly be expected in a bed washed by a rapid stream during nine months of the year," are sufficient data to deter the Government from undertaking the construction of such works with the modification to the uninterrupted Current proposed to be introduced?

A. I have not had much experience that would enable me to give an opinion, even if I had been provided with the Plans and personal knowledge of the localities, all so necessary to be considered; I may however say generally, that I conceive it is very seldom that ground will be met with, where such a work may not be securely founded. With regard to Major Schalch's objection, I do not think it valid, or any reason why Government should not undertake the work.

Q. 4. Whether you consider Captain Prinsep's objections to Major Schalch's proposed Basin, between the Sleeper Dams at Sambazar and the River during the rainy months when the communication is closed, sufficiently obvious?

A. As far as I am able to judge from experience of the effects on a Channel closed in the end, leading from a River with a strong Current loaded with mud, I should think the effect would be to fill up the Basin to such a degree, as to make it useless as a place of refuge, except to the smallest Craft, and probably so much, that the action of Tides, low, compared with what they were when the deposit was formed, would not suffice to clear the Channel on the Sleeper Dams being removed, without previous expensive excavation under water.

Q. 5. Whether the system of Gates proposed by Captain Prinsep are sufficient, or whether you conceive that the additional expense of a third Gate, which would give the means of what is called penning or locking in and out, at any state of the Tide levels, would be warranted by the superior advantages and security it would offer?

A. I have before said, I do not conceive the Tide Gates alone sufficient, and I think that if it be worth while going to the expense of forming the Canal, the additional expense of the third Gate and its attendant extension, the Masonry should be authorised, as it would secure a communication at all times by locking, except when the River was lower than the Lake, and prevent the necessity of running the risk attending the shutting of simple Tide Gates with a strong Current.

Q. 6. Whether you consider 24 feet a sufficient breadth between the cheeks of the chamber or passage?

A. Probably too much, as I believe 2 feet beyond the extreme breadth of the Craft to be passed quite enough, at least for a Lock, and the less the breadth of the Gate, the less the risk of danger to them.

Q. 7. Whether the mode proposed of fastening back the Gate, to allow a passage of water during a part or a whole period of Tide, is practicable, and whether the closing them while a Tide is running through them, at the rate of 2 or 3 miles an hour, would be attended with any danger or difficulty from the press of water or fouling of the Floor ?

A. There can be no difficulty in keeping the Gates open, when once they were so, and perhaps no great danger in shutting them with the Current through the Race or Channel as stated, but from its confined size, as compared with the Canal below it, the Current will increase most rapidly with the rise of the Tide, as it cannot pass the water fast enough to fill the Canal below, and keep an equal Current from the River level to that of the Lake, and I do not think a Native could be trusted or expected to know when they ought no longer to be open. If a Gate was long open, a Deposit might form requiring to be displaced, but if frequently worked, none of any consequence would be likely to occur.

Q. 8. Whether when the Gates are closed against a press of 10 or 12 feet of water, there would be any danger of bursting the Gates, in case *their* adjustment were not perfect, and leakage should happen beneath them or at the sides, and whether leakage is of any consideration when the economy of water is not an object, as in the present case ?

A. I fancy this Question should have been "when the Gates are closed *with*, instead of *against* a press of 10 or 12 feet of water," as I cannot see how the case stated can occur. I look on the question to be No. 7 in an extreme degree, and then there is in my mind no doubts of the danger, if the Gates are let loose unsupported. If one door or leaf shuts before the other, I think under such a pressure it would be wrenched off its fastening ; but think it practicable to shut them even in this case with safety, by a supporting Guy to the upper outer corner, eased off gradually from a well-manned capstan, until both doors meet in their true position, and mutually support each other. I do not see what harm leakage can do.

Q. 9. Whether in case of any apprehension of failure of an Outer Gate, the Sleeper Dams proposed would be sufficient to prevent any irruption of water during the greatest press, and whether the lowering of such Sleeper would be attended with either difficulty, delay, or danger ?

A. If the timber of the Sleeper Dams are in scantling sufficient to support the extreme pressure, there can be no doubt of their answering the purpose required, and if lowered in anticipation of a failure, before the Gates gave way, no difficulty would attend the operations beyond that of getting them into the Grooves. If to be lowered with a flowing Current, the greater the velocity the more difficulty there would be in sinking them ; but it does not appear a difficulty which may not be fully provided for.

Q. 10. In constructing the foundations, whether you would give the preference to a floor of Timber, or to an inverted arch for the chamber of the passage, supposing the soil not unfavorable to such construction as stated, from the Borings made ?

A. I can hardly answer this without a section, shewing the foundation of the Pier in connection with the flooring of the Chamber, as proposed ; but as far as I can judge, I would prefer a counter-arch for the Chamber, rather than a frame or flooring of Timber.

(Signed) J. N. JACKSON,
Secretary, Canal Committee.

(Signed) JOHN COLVIN, Captain,
Superintendent of Canals, Dellee Territory.

(True Copies.)

(Signed) J. N. JACKSON,

Secretary, Canal Committee.

[Superintendent of Canals Report of Dredging Machinery and operations in the Channel of the Salt Water Lake.]

The operations in deepening the Channel at the Western end of the Salt Water Lake, and within the mouth of the Eastern Canal, have been attended with every success that could have been expected; the Navigation of this part of the Channel is already very sensibly facilitated. By an admeasurement of depths in July 1827 and July 1828, a gain is manifest in the shallow part where the machinery works of $1\frac{1}{2}$ feet to 2 feet, the length being 6,000 running feet.

A short distance of 300 feet, where the bed is of a harder clay, is the only part where the machinery has met with any difficulty in excavating its full daily quantity of six boat loads, equivalent to about 1,800 mds. or 50 tons. In working at this part, the sheet iron buckets and endless clam have suffered great dilapidation, and a constant monthly expense has been necessary to repair them, and supply the place of those rendered unserviceable.

The remaining part of the Channel requiring excavation, has a bed of soft clay and rubbish, which offers little or no resistance of consequence, and quickly yields to the machinery. It was indeed of so fluid a nature when the excavation first commenced, as to fill in from the sides whenever the bed was deepened by the Machinery, so that the depth shewn by measurement, compounded with the length and breadth over which the machinery has passed, will be an insufficient measure of the mud carried away.

The second Dredging Machine is now finished and at work. Its construction is upon the same principle as the first, and I have therefore thought it unnecessary to forward a Drawing. In constructing it, I have however applied many improvements, which were suggested by my experience of the three machines of this description which have now worked under my charge, and the present Machinery will, I hope, be found more perfect and satisfactory in every way.

With the additional aid of this second Machinery, I hope to be able to report in a most favorable manner of the state of the Lake Navigation, as far as depth of water goes, in my next year's report; till which period I defer any proposition relative to the construction of tracking paths and subsidiary objects of that nature.

New Canal between Ghoonamegee and Kantatullah, and thence to Bha-meenghatta, with Plate No. 5. E.

The Eastern mile of this Canal has been carried through a Country raised considerably above the Tide Levels, and requiring much additional excavation.

The first 3,000 feet, as seen in the section, although excavated to an average depth of 15 feet, yield no more than 8 to 10 feet of water, the level of the surface being 5 to 8 feet above High Water mark.

The following three thousand feet have been excavated to the average of 10 feet, but yield only 5 and 6 feet water. Across this part of the track of the Canal, extends another spit of sand, similar to those at Bhowaneepoor and Chaltabarya, the frequent occurrence of which in these Districts I have before remarked to the Committee, and the nature of which is such, as to preclude the possibility of the excavations being carried in the first instance beyond a certain depth, (generally 5 to 7 feet below High Water mark,) without an expense much greater than would be warranted by the advantages expected from the Canal.

Of this Canal I have only opened to the admission of the Tide 7000 feet, of which there are parts where the slope has been left in steps, from the Contractors failing to finish the dressing of the slope within their time. This is of little importance, and may easily be rectified.

Of the remaining portion between the Bund B. of the 7th Lot, and C., where the Canal enters the inundated Jungul Land, so much has been left unfinished by the failure and general distress of the Contractors, that I have not thought it proper to open any portion to the Tide, until the whole is complete.

With some exertion, I have here prevented any necessity for incurring great expense in lifting the water to finish the bottom after the rainy season, by finishing the section wherever the Excavations deserted by the Contractors' workmen had attained the depth of 8 or 9 feet to the full depth of 10 to 12 feet, which will be found sufficient for every purpose of the Canal.

I have so enclosed these unfinished Excavations, that nothing but rain water can enter them; and it is my intention to use them for the supply of fresh water during the approaching season's operations Westward, until the water in them falls to a level, which will allow me to finish those parts abandoned at the fifth and sixth foot.

From C. the line enters upon the Jungul, and I had first to clear and embank the portion from C. to D. against daily inundation by the Tide. The first 1,000 feet of this part was ready for Excavation in January, and a Contractor, who ultimately failed in excavating more than 528 feet to the depth of 3 to 6 feet, was established upon it in February.

The remaining portion to D. was cleared and embanked; but as the difficulty was greater, I commenced in March to excavate this portion under my own eye, with Coolies receiving daily pay, and subject to a daily measurement of work. I had not been able to excavate more than 300 Chowkas of this line in May, when I found myself obliged to bring all my disposable hands to assist the Contractors of Nos. 8, 9, 10, 11, 12, and prevent the Excavations from being left at a dangerous depth, or one that it would be difficult or expensive to lay dry in a following season.

In short, of the 17,500 feet between A. and D., 13,500 only have been commenced upon, 7,000 opened to the Tide, the remaining 6,500 only about two-thirds finished. The total number of Chowkas completed being 12,000, there will remain 9,500 to excavate next year up to D, besides the Canal of one mile, between E. and F. to Bahmeenghatta.

The average inclusive rate per Chowka* has differed very little from that of last year, and the rate per mile of Canal will therefore still fall short of 10,000 Rupees.

* This year 1 : 12
Last year 1 : 12:

The amount Balance left outstanding, and which I am now rapidly collecting, is Rs. 3,157 : 6 : 4; by no means large in proportion to the outlay of Rs. 21,926, more especially when the difficulties of the season are considered.

State of the Chaltaberea Canal and the Works executed in connection with it during the season.

The expenses incurred in assisting the free passage of the Tide through this Canal, by deepening and enlarging the Bhungur Nullah into which it leads, have amounted to 2,550 Rs.

The Excavations have been confined to the Channel below the points B. and A. of the Plate,† bearing date August 1827, which also accompanies this Report.

† No. 2. B.

It was also my intention, during the present year, to have deepened the 7,000 feet of Old Nullah, between the Western end of the Chaltabarya Canal and the New Goonamegee Canal, and for that purpose, I had closed it from the Tide in February and March, and laid a great portion of it dry. It was, however, so late before the soft mud which forms the

‡ Costing 620:7:9. bed had dried sufficiently, that I had not been able in May to finish more than 1,000 feet,‡ when I found myself under the necessity of otherwise employing all my daily Coolies; 6,000 feet therefore remain for the approaching season.

The effects of what has been done to enlarge the mouth of this Canal are already apparent. I attach a Schedule of the phenomena of Tides, shewing their slopes in November, March, and July. The velocity and power of the Tide, which bears a certain relation to the slope of its surface, is evidently gaining progress within the point B., or mouth of the Canal. In November, when there was much obstruction between A. and B., the greatest slope during the Ebb is found between those points, while in the Canal the water remained comparatively still, and of even level. In March, when those obstructions were removed, and a greater freedom afforded to the Tide in its passage from B. to A., and even farther East, the greatest slope is found to have retired within the Canal to the portion between the 6th Lot and B. In July again, when the passage of Tide was still more free, and the effect of the head of water kept up in the old Western Nullah was brought to play, the greatest slope had divided itself nearly equally over the whole length of Canal under this form. I observe the softer part of the banks to suffer a little, and I may hope gradually to discover an action upon the sandy bed.

The accompanying Schedule of Tide will shew the Committee, that a Canal under the circumstances of the Chaltabarya Canal, can never require the great depth of a Canal more immediately in contact with the larger Creeks, in which the rise and fall of Tide amounts generally to 7 and 10 feet. With this view, I have assumed as a requisite depth for the Bahmeenghatta Canal, 2 feet less than would be otherwise necessary, if therefore the lapse of another season shews it to be absolutely necessary to go to the expense of excavating those parts of the Chaltabarya, and 3,000 feet of Bahmeenghatta Canal, where the sand has prevented a sufficiency of depth, (which will I believe be easy now that the sand of the bed has had time to admix with the clayey particles carried along by a gentle Tide,) an additional 3 feet average will be amply sufficient to answer every purpose of Navigation.

No. 102. *b.*

Bhowaneepoor Canal.

From a knowledge of the local difficulties of this work, I commenced and have carried it on entirely by daily workmen in preference to contract. The season has been unusually unfavorable, and I have not been able to complete more than 3,700 feet of Canal, the whole length required being 10,000.

Upon advances of 2,500 Coolies, I found myself unable to collect and retain upon the work a greater number than 9 and 700, which perhaps may be within one-third of what I can ever reckon upon collecting in such an unfavorable spot. The sickness, and consequent panic that prevailed in March, reduced this number to 300, which was never exceeded for the remainder of the season.

The method of conducting this Canal has, however, secured me against any loss from this failure in the number of workmen, and I have the satisfaction of knowing, that the whole Section, 3,700 feet, opened, has been finished to the full depth of 12 feet.

The Contingent and Establishment Charges upon this Canal are unusually heavy, on account of the nature of the work. The expense of ridding the Section of large roots alone has amounted to Rs. 1,027:14:0; that of supplying fresh water to the workmen Rs. 448:12:0. I have however every expectation that the rate per mile, even under these great disadvantages, will not reach 15,000 Rupees.

I have no farther remarks to offer in addition to those of last year, upon the track over which this Canal has to proceed. The line there marked out A, B, C, D, E, F, has been strictly followed, and the Excavations have reached B., and passed within the Northern edge of the spit of sand without any diminution of depth.

Vide Plate C. or
No. 3.

I hope to be able to complete the Canal during the approaching year.

No. 102. c.

Kullooardam, and Works connected with the Canal at Hoseinabad.

The Committee have already before them my Letter 112,* giving an account of the causes which baffled my endeavors at stopping the head of the Kullooar Creek, upon which the orders of the Governor General in Council have already been passed. A few observations will not be thought misplaced in this my final Report upon the season's operations.

* 3d May, 1823.

A disappointment of the kind in a work which has frequently been practised with success by the Native Zemeendars, to whose usual method of construction I added much of a more substantial description than is usually applied by them, cannot but weigh heavily on my own mind, and may tend to diminish the confidence of my employers in my zeal and exertions. The Committee will, however, take into consideration the local difficulties of the place, as well as the difficulties of the seasons. They will also acknowledge that the large Zemeendar possesses means of collecting labourers, and possesses an influence to ensure their attendance upon the work, which no European or stranger in the District, without the aid of magisterial powers, can ever bring into action. The spot upon which the work was carried on, being the same upon which my predecessor's labors upon the Balleygunge Canal proved so disastrous, I took more than usual precautions for the comfort and health of the great quantities of people whom I expected to be able to collect, to protect myself against the same fearful desertion which a similar panic had created in 1823-24. The line of road of $1\frac{1}{2}$ miles through Jungul leading to the work, was placed in good repair, and cleared to prevent any imaginary danger from tigers from seizing them in their path, extensive sheds were prepared for their accommodation on the banks of the Eshamuttee, and in the neighbourhood of the only tanks within some miles. A large establishment of Boats was kept up for providing the people, when at work in the Jungul, with fresh water. In short, I spared no precaution I could think of, and incurred much larger contingent expenses than I had contemplated in my Estimates.

The great dread of the Jungul which pervades the Districts at all removed from its immediate neighbourhood, and perhaps the memory of what they had suffered in the year 1823-1824, when engaged upon the Bayleygunge Canal, protracted the period when I had sufficient numbers collected to commence the Dam to a time when the Tide had gained a greater force than I could have wished to contend with; much unlooked-for expense was thus occasioned, and the uncertainty of the undertaking proportionally augmented. The rise and fall of Tides between October and the end of February never exceeds 7 feet extreme; from this period the encrease; and in April and May the extreme

Surface.	Soft Mud.	rise and fall reaches 11 feet. From the marginal note detailed, the general strata in which the Excavations were carried on, it will be seen how little consistent soil fitted for the purpose was procurable, and how much extra digging was necessary. The practice followed was not to reject the upper 5 feet of soil, but either to protect it from corrosion by the rapid Tide with the heavier clays from underneath, or when the dykes were more
0 6 .	Rotten vegetable matter and roots spongy and light.	
1st.		
3 6 .	Stiff clay, wet	
5 0 .	Clay, compact.	
8 6 .	Peat and vegetable.	
9 0 .	Remain blue clays, with sand not very consistent.	

advanced in the stream, to enclose the whole of the lighter soils with a proportion of the heavier in the large baskets (doles) of 4 feet height and 3 feet diameter, which I had made for the purpose, over which the Tide might break without danger of carrying any portion away.

There are two points upon which I believe I might have obtained greater certainty, if I had followed my own judgment, in preference to the system which the Natives of the District usually adopt. The 1st. If I had from the first substituted European built condemned Craft (Sloops) in preference to the large Native Craft, 2 to 4,000 mds., which proved too slight. The next. If the pile driver had been more powerful, so as to have bottomed the piles in ten or 12 feet of soil, instead of 6 or 8, beyond which my ram failed in driving them.

In March, when I had collected the greatest number of hands, the work proceeded rapidly, and although the soil used was of so bad a quality, the rows of piling, the sunken boats and facinage, the defence of doles built like masonry, and the great quantity of mud thrown in daily, prevented the spreading force from being of so serious consequence as it proved, when in April desertion of the Coolies so reduced the quantity of mud built in daily, as to allow the water to mix more with the new earth thrown in, and prevent the dyke from consolidating properly during its progress by its own weight.

Although I have little doubt in my own mind that the work would have succeeded, even so late in the season as April, but for the loss of hands created by the dread of the Cholera, which raged so fearfully, I cannot say, that in a second attempt I should be willing to pursue an exactly similar mode of construction. The mode adopted offered economy, but was precarious. Other methods might easily be pointed out, attended with much greater expense doubtless, but which would offer infinitely more certainty.

The expense attending the work as per Abstract, has much exceeded the sum stated of 12,000 Rs. From the total amount in my accounts, rendered under the head *Kulloorar Dam and other works connected with Hoseinabad*, is to be deducted an amount of 1,606 : 6 : 0 Rs. expended extra for excavating a Cut of 700 feet across the neck of land between the Dansar Kahl and mouth of Baylygunge Canal, the soil of which was carried at great expense to the Dam at the distance of 3 to 800 feet ; also a sum of Rs. 200 : 7 : 9 for some additional excavations in the Baylygunge Canal, during May ; also a charge of 632 : 14 : 4 Rs. for excavating the mouth of the Hoseinabad Canal to the depth of 5 feet below H. W. M. ; the season having been too far advanced when I commenced it in June, to excavate deeper, it will require some additional labor in the approaching season, unless the strength of the Current through it from the Eshamuttee during the Freshes render this unnecessary.

Eastern Canal Roads and other Miscellaneous Works, executed in the season ; not immediately connected with the Scheme of Canals.

In executing the repairs to the Roads on the two banks of the Eastern Canal, as authorized by the Canal Committee, 30th November 1827, I deviated from the exact proposition and estimate for that portion immediately before the Wood Bazar, in a manner which from the great advantages it has afforded to the firewood trade, I hope will meet the approbation of Government.

It was my intention to have dismantled a certain number of the huts of this Bazar, the ground of which is the property of Government, in order to give an additional breadth to the Road. Finding that there would be great delay and some difficulty in carrying this into effect, I examined the nature of the soil which had been deposited before it by the Main Drain of Calcutta, by which the Craft employed in the firewood trade had been prevented coming within 600 feet of the end. Its nature was more favorable than I could have expected, and

I have now built a new slope, giving additional breadth to this part of the Road, from a Channel excavated to the depth of 4 feet, by which the Craft may come to the very Western extremity of the Canal.

The remaining repairs have been executed as proposed. The 2,500 feet of Khoa before the different Bazars is found of the greatest advantage; for notwithstanding the attention paid to the slope and drainage of the Road, the soil is of much unfavorable quality, and the passage of wheeled carriages so incessant even during rain, that many parts are very deep, and are likely to be much cut up before the dry season.

There are also some parts where the adjoining proprietors have prevented the Drainage of the Road, and it appears indispensable to construct some arched Drains across the Road in many parts, where there is no other way of leading off the water but into the Canal.

In the month of October last, I had the honor to submit some remarks upon the Bed and Tides of Tolly's Nullah, and I received the orders of the Committee to try an experimental Dam, which I by no means offered as sufficient to remedy the great defects of that Navigation, but as likely to afford some little relief in the draught of water left by the Ebb Tide.

The great concourse of boats in this Nullah, and constant passage to and fro made it dangerous to hazard an experiment of the kind at the Allypore Bridge, I however constructed four Gates or Shutters, and erected in the month of January two into a Dam at Gurriahaut, and two into a second Dam at a distance of two miles East of Gurrya.

The Gates swung upon their pivots to every Tide, and answered every purpose in point of construction.

From the moment of their being fixed, I have kept a daily register of the Tides in the two places; but from not having a registry to the same nicety for any former year, I cannot ascertain, with any great precision, the effect created by these Shutter Dams.

I am not sensible of having made any greater difference than 3 or 4 inches, in the lowest state of the Tide by these Dams; nor could I expect, without a corresponding Dam at Allypore, that any great inequality of action could have been created. The immense concourse of boats in this Channel have also great power in diminishing the effect of any such contrivance. I could, however, sensibly perceive an afflux at each Dam while closed against the Ebb, and also that the Ebb Tide fell to its lowest level much more gradually than after I had removed the Dams in April.

During the Neap Tides of the five dry months of the present year, the draught of water left in the Nullah at Gurria was 2 to $1\frac{1}{2}$ feet; three miles of the Canal in the neighbourhood of Rasypugla being left quite dry, or with only 6 inches water. The bed has not filled up, and this circumstance is an illustration of my remarks of October last.

The annual variation of Tide at Gurrya appears by my observations to have increased from 8 feet 5 inches to 9 feet 4 inches, and may be expected to increase still more by the removal of more obstructions.

The general result of the experiment has, I fear, not been such as to warrant its more extended application in this Nullah, where there are so many causes to diminish its effect, and many objections to any multiplication of the present obstructions to the Navigation.

The expense has been very close upon the Estimated rate of 200 Rupees per Dam, the amount being 469: 2: 4, inclusive of contingencies and establishment. The Gates and Frame Work remain in store, in perfect order, for any purpose to which they may be thought applicable hereafter.

Scheme for the Muffussil operations during the approaching season 1828-29.

In preparing the annexed Scheme, which will otherwise appear on too limited a scale to engage my attention when compared with the expense of the whole Canal Establish-

ment, I have reckoned upon a certain prospect of being enabled to begin during the season 1828-29 upon the Circular Canal, in which hope I trust I may not be disappointed.

The Committee will, I have no doubt, understand my hesitation in submitting a specific Plan of proceeding upon the Circular Canal for the next year, with an Estimate of the Funds which I should require to be placed at my disposal, as such Plan would appear premature while the design for the construction and management of that Canal is yet under discussion.

The year's operations upon this Canal will depend a great deal upon the extent of ground at my disposal; but I should conceive, that under any form of construction which may hereafter be sanctioned, as the commencement will be upon the Southern Divisions, there can be little question as to the method of beginning the work, I am therefore fully prepared, should the Committee place the ground at my disposal, to state the measures and outlay I consider necessary for the first year's progress.

If however it is found impossible or unadvisable to allow me to embrace the Circular Canal in my Scheme for the approaching year, and it is judged that it would be better to extend the line of Muffussil operations to the Eastward of the Eshamuttee, to which I have heretofore limited myself, I have to request that the Committee will apprise me of such determination at an early moment, that I may make the necessary arrangements.

The Scheme I have to offer at present, is the Dredging operations for the whole year, at an average of 700 Rs. per month, Rupees 8,400

Bahminghatta Canal.

Unfinished Excavation, equal to $\frac{1}{2}$ mile

Unopened ditto, 2 do.

$2\frac{1}{2}$ miles 25,000

Remaining 6,000 feet of Old Nullah to deepen, 2,500

Bhowaneeepoor Canal, 6,300 feet at this year's rate of $1\frac{1}{4}$ mile, 18,000

Some expenses necessary at Hosienabad and Bayleygunge, estimated at ... 500

To this may be added some Cross Drains to the Balyaghat Roads, five

Drains @ 50 if approved, 250

The Total Amount is 54,650

from which deducting the amount of balance of last year's Assignment undrawn 26,000 Rs., and a further balance in hand of Rs. 1,042 : 8 : 10; the additional funds required for the Muffussil operations of the approaching year, exclusive of the Circular Canal, will be Rs. 27,607 : 7 : 2.

(Signed) THOS. PRINSEP, *Captain, Engineers,*

22nd August, 1828.

Superintendent of Canals.

No. 107.

Answers by Captain W. N. FORBES, (Engineers,) to the same Queries to which Answers were requested from Captain JOHN COLVIN, Superintendent of Canals, Delhi Territory. See page 93.

A. 1. I am of opinion that without Dams, Tide Gates, or Locks, the Current entering or retiring through the Canal may, by various means, be made so to modify and regulate itself, as to admit of safe and convenient Navigation at all times of the Tide, and at all seasons of the year.

A. 2. I conceive that it would be beneficial and practicable so to construct the Canal, as to dispense with Tide Gates.

A. 3. Were the Plan involving a necessity for Tide Gates adopted, all difficulties of construction could be overcome.

A. 4. I consider Captain Prinsep's objections to Major Schallch's Basin perfectly well founded; further, that by the Plan proposed by Captain Prinsep, the Navigation may very safely be maintained during particular states of the Tide at all seasons of the year.

A. 5. With Tide Gates, I conceive that the additional expense of a third Gate, affording the means of Locking in or out at all states of the Tide, would be warranted.

A. 6. I believe that 24 feet betwixt the cheeks of the Gate passage, would be sufficient breadth.

A. 7. The Current might be managed, so as to prevent fouling, or difficulty in opening or shutting the Gates.

A. 8. Supposing the Gates well constructed, there will be no danger of their bursting; according to the views the data furnished have led me to, I conceive any probable leakage will be advantageous.

A. 9. With reference to the repairs of the Gates and other considerations, the Sleeper Dams might conveniently be placed exterior to the Gates.

A. 10. The preference ought decidedly to be given to an inverted Arch with a considerable versed Sine.

October 24th, 1828.

(Signed)

W. N. FORBES,
Captain, Engineers.

CANAL COMMITTEE'S OFFICE,

CALCUTTA,

7th April, 1828.

(A true Copy,)

(Signed) J. N. JACKSON.

No. 108.

Answers by Captain W. R. FITZGERALD, (Engineers,) to the same Queries to which Answers were requested from Captain JOHN COLVIN, Superintendent of Canals, Delhi Territory. See page 93.

DUPLICATE.

A. 1. Of the two Plans proposed, I would give the preference to the system of Tide Gates.

A. 2. I consider the system of Tide Gates to be the most efficient method of preserving the Navigation of the Canal, under the circumstances stated.

A. 3. It appears to me that the objections mentioned by Major Schälch are insufficient; the construction of the Locks themselves obviates all danger to be apprehended from the rapidity of the stream.

A. 4. I think the objections are just, but I am of opinion that practically the deposit in the Basin of Shelter would be removed upon the Cutting of the Dam, though probably to the injury of the Canal.

A. 5. One Gate I should imagine would be sufficient for all the purposes of security. The construction of an additional one seems to me, to be a matter of convenience, and to depend on the probable amount of the Revenue derivable from the Canal.

A. 6. Yes.

A. 7. I am of opinion that it is. That the danger arising from the press of water, &c. can be overcome.

A. 8. I should think that no danger need be apprehended, and as a bed of Masonry is to be constructed across the passage, leakage cannot be of any consequence.

A. 9. The proposed Plan of the Sleeper Dams appears to me to be sufficient.

A. 10. An inverted Arch would I think be the most durable, more particularly if Stone were used in the construction.

(Signed) W. R. FITZGERALD,
Captain, Engineers.

CANAL COMMITTEE'S OFFICE, (A true Copy,) CALCUTTA
(Signed) J. N. JACKSON.
7th of February, 1828.

No. 109.

Answers by J. KYD, Esq., to the same Queries to which Answers were requested from Capt. JOHN COLVIN, Superintendent of Canals, Delhi Territory. See page 93.

A. 1. Should the line of communication be fixed or confined, so that the difference of level cannot otherwise be surmounted than by Gates, I agree entirely in the propriety of Captain Prinsep's Plan; but if it be possible to lengthen the line of communication, in that case, a lengthened winding course, so as to reduce the fall of Water, similar to what nature observes in Rivers, will, I think, be a preferable mode, being simpler, and requiring no Locks or Gates whatever.

A. 2. Answered by the first Answer.

A. 3. No difficulty whatever.

A. 4. Captain Prinsep's objections to Major Schalch's proposed Basin are sufficiently obvious.

A. 5. I should prefer the 3rd, or rather the 3rd Set, for there ought to be 2 Gates, so as to have the advantage of Penning or Locking the Water in.

A. 6. Sufficient.

A. 7. Quite practicable. No difficulty or danger.

A. 8. No danger of bursting. Moderate leakage of no consequence.

A. 9. The Sleeper Dam would be quite sufficient, but its position ought to be outside of the Gates. No difficulty or danger.

A. 10. An inverted arch.

(Signed) J. KYD,
Master Builder.

No. 110.

Answers by Major JOSEPH TAYLOR, to the same Queries to which Answers were requested from Captain JOHN COLVIN, Superintendent of Canals Delhi Territory. See page 93.

MY DEAR JACKSON,

I did not keep a copy of my reply to the Queries proposed relating to the Canal, but I very well recollect, that I coincided in opinion with Captain T. Prinsep.

Yours very sincerely,

27th December, 1828.

JOSEPH TAYLOR.

No. 111.

(Copy.)

TO H. MACKENZIE, ESQ.

Secretary to Government, Territorial Department.

SIR,

I have now the honor, by desire of the Canal Committee, in reply to Mr. Offg. Secretary Prinsep's Letter, under date the *6th of December* 1827, but more particularly to its 3rd Paragraph, to submit in original the Queries given to the several Officers named in the margin,* together with their Replies.

In the face of the unanimous opinion of so many persons of acknowledged talent as Engineers, and which coincides so closely in all points of material importance with the views and opinions of Captain Prinsep, the Committee feel it unnecessary to do more than submit the whole of the Documents, for the consideration and orders of the Right Honorable the Governor General in Council.

When the Original Papers herewith forwarded shall be no longer required, the Committee request they may be returned to their Office for record.

I have, &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
3rd November, 1828.

(Signed) J. N. JACKSON,
Secretary to the Committee.

No. 112.

To W. MONEY,
J. MASTER, } ESQRS.
C. R. BARWELL, }

Canal Committee.

Territorial Department, Miscellaneous Revenue.

GENTLEMEN,

I am directed by the Governor General in Council, to acknowledge the receipt of your Secretary's Letter, dated the 3d November last, with its enclosures, and to inform you, that His Lordship in Council approving generally the Plan proposed by Captain Prinsep, desires that that Officer may be directed to take the necessary measures for carrying it into effect.

2nd. You will be pleased to ascertain and report the amount of advances required by Captain Prinsep.

3rd. The original Papers received with your Secretary's Letter are herewith returned, copies having been kept for record.

I have, &c.

COUNCIL CHAMBER,
The 6th January, 1829.

(Signed) HOLT MACKENZIE,
Secretary to the Government.

No. 128.

No. 260.

TO MAJOR J. N. JACKSON,

Member and Officiating Secretary of the Canal Committee.

SIR,

I have the honor to submit for the information and scrutiny of the Canal Committee, the yearly abstracts of expenditure in the Department of Canals for 1829-30, together with a Report of the progress of the several works under my charge, and a sketch of what remains to be effected during the approaching season.

2. The Committee are well aware of the painful circumstances under which the Governor General in Council was pleased to entrust to myself, the completion of the undertaking partly planned, and so long conducted by my brother, the late Captain Prinsep.

3. It has been my object, and indeed my pride, to follow implicitly his designs and measures, and to act exactly as I conceive he would have done, had his life been spared to accomplish and complete them.

4. His views of the past operations and remaining objects of the Canal works are before the Committee in the fullest detail; they have met the Committee's approbation, as well as the final sanction of the Government. They have formed my guide; leaving me few difficulties to cope with in their execution, and these few have been lightened by the trained experience of the establishment transferred to my orders, and by the extreme exactitude of all the accounts and records attached to the Office.

5. I beg to refer the Committee rather to my brother's reports, than to my own for the premises upon which to ground their directions for the ensuing year's operations, as I feel myself as yet too inexperienced to dwell with conviction upon my own opinions; besides that, ill health and other official avocations have prevented my devoting my whole attention to the subject of the Canals: I trust, however, that the Committee will have no cause for dissatisfaction in the general progress of the works.

6. I beg leave incidentally to acquaint the Committee, with the publication of my late brother's Map of the Soondurbuns, which I hope will prove useful in promoting the intercourse of Eastern traffic through the Canals. I was induced to publish this Map, and a smaller Chart of the Delta Navigation, in pursuance of my brother's intentions, and from his own corrected Manuscripts, because I found a general wish for an authentic Map prevailed, and none of those which I heard of, seemed so well calculated to answer the purpose as the MS. in my possession. The Government have been put to no expense in its publication; and the profits have been devoted, according to my brother's wish, to the artist, (Mr. Tassin,) who executed the lithography of his Charts of the Ganges.

I have the honor to be,

Sir,

Your most obedient humble servant,

JAMES PRINSEP,

Superintendent of Canals.

OFFICE OF SUPERINTENDENT OF CANALS,

CALCUTTA.

15th September, 1830.

Report on Canal Operations 1829-30, 15th September 1830.

In the Report submitted to the Canal Committee in September 1829, the several works projected for the ensuing season were classified under two heads; 1. Mofussil operations, and 2. Circular Canal; under the former head were included—

1. The Dredging operations in the Salt Water Lake and Eastern Canal,
estimated at Rs. 7,200 0 0
2. The Bahmunghatta Canal, 2,800 running feet, 8,000 0 0
3. The Chytul Canal, one mile Cut, 10,000 0 0
4. Deepening the Bayleygunj Canal, above 5 feet, 8,000 0 0

Making a total expenditure of Sa. Rs. 33,200 0 0

Under the Head of Circular Canal, were specified (without estimate) for the year's operations, to be covered by an assignment of Rs. 1,00,000—

1. Three Suspension Bridges of the Bytukkhana, Maniktela, and Narkuldanga Roads.
2. Brick-making, namely, 50 lakhs to be burnt.
3. The Double Flood Gates at Chitpoor, at 60,000 Rs.
4. The continuation of the excavations: the whole length of which being 20,000 feet, whereof 10,500 were Cut in the past season, leaves about as much more to complete the work.

2. The Operations of the season were prosecuted in accordance with this Plan, and although impeded by the lamented loss of the Superintendent, and the interruptions of a peculiarly wet season, the greater portion of the work laid out has been accomplished.

3. The accompanying Abstract of the year's expenditure shews, that it has not materially deviated from the above Estimate; for comparison's sake, I will recapitulate the several items, and afterwards proceed to explain the circumstances of each.

- | | | | | | | | | |
|--|----|-----|-----|-----|-----|-----------|----|-----|
| 1. Dredging Operations, | .. | .. | .. | ... | .. | Rs. 6,841 | 4 | 2½ |
| 2. Bhamunghata Canal, 4,263 running feet, | .. | .. | .. | .. | .. | 8,631 | 5 | 6 |
| 3. Bhojdigee Canal, (finishing 557 choukas,) | .. | .. | .. | .. | .. | 1,580 | 14 | 2½ |
| 4. Chytul Canal, (excavated ⅔rd depth,) | .. | .. | .. | .. | .. | 5,015 | 10 | 11½ |
| 5. Bayleygunj Canal deepened, | .. | .. | ... | ... | ... | 8,489 | 11 | 10¾ |
| 6. Balya Ghat Road Drains, | .. | ... | ... | ... | .. | 41 | 15 | 2 |

Making a total expenditure of Sa. Rs. 30,603 13 11¼

4. Upon the Circular Canal have been expended, as per Appendix B.

- | | | | | | | |
|--|-----|-----|-----|------------|----|-----|
| 1. Excavations of 6083 running feet, ... | ... | ... | ... | Rs. 33,735 | 12 | 11½ |
| 2. Masonry and Contingencies of Bridges, | ... | ... | ... | 20,368 | 2 | 4 |

Making a total of Sa. Rs. 54,103 15 3½

5. I shall now proceed to offer a few remarks upon the several works, in the order above enumerated.

I. Dredging Boats.

6. During the whole of the year, the Dredgers have been at work upon the Eastern Canal, ranging from the Lake to the Bund East of Kood Ghat, up to which the Canal had been deepened by hand in the year 1827.

7. To judge of the effect actually produced by the continued action of the two Boats, I had soundings taken along the 5,000 feet of Canal operated upon during the present and former years, (Appendix D,) and find therefrom, that the general bed of the Canal has been deepened on an average two feet and six inches since the 26th December 1827. I am unable to say how much of this is due to the last season's work, but assuming as the maximum one-half, or 1 foot and 3 inches, it follows that the cost of Dredging 5,000 feet to that depth has amounted to 6,800 Rupees, or nearly one Rupee per running foot, for one foot of depth. The expense of bunding and deepening the Western half of the same Canal to a clear depth of 4 feet, was about 5,000 Rupees per 6,000 feet run; or less than one-fourth of the foregoing. As the prime cost of the Engines and Boats is not included in this comparison, the disadvantage of the employment of Machinery must be acknowledged to be still greater than I have estimated it to be: in fact, the wear and tear of the Boats and Iron work, or rather the continual patching of the chains and buckets, and the caulking of the Boats, which but partially represent the wear and tear, cost annually as much as the labour and establishment. At the present moment, the Machinery of the old Boat* is hardly in a servicable condition, and the Boats are not trustworthy: one of them indeed fell to pieces in July last, and I had some difficulty in extricating the Dredging Frame, which sank with it, and in procuring a Boat of the same size to take its place; this accident, and the price of the new Boat greatly enhance the month's expenses.

8. From these considerations, the Committee will be prepared to find me object to the employment of Dredging Machinery, where manual labour can be more directly applied: perhaps in the present instance as sufficient depth has been attained for the purposes of Navigation by the Boats of the Lake, it is not worth while *now* to resort to the method of Bunding, and as long as the Boats last, they may remain engaged as at present. I should beg, however, to recommend that the Old Boat, when it ceases to be repairable without disproportionate expense, should be taken to pieces, and the parts available be kept to repair the New Boat. The latter being of stronger construction, will always prove useful, and indeed there are many cases in which such an apparatus is indispensable, as in digging away the under water-bases of Bunds, and clearing parts of the Lake Channel to which Bunding would be inapplicable.

9. I have endeavoured to reduce the establishment and the contingent of the Dredgers, (as per margin,) and hope to effect further saving by abolishing the Smith's Godown, (for which rent is paid,) and bringing this department under my own eye at the New Mint, when my office shall be removed thither.

10. As it is impossible to say how long the Old Dredger may continue capable of doing work, it will be safer to include in my scheme for the ensuing year, the same disbursement for Dredging as was sanctioned last year, namely 600 Rupees per month.

Former Estim.	Present Estim.
Chuprassee, .. 1	.. 1
Classees, .. 4	.. 2
Manjee .. 2	.. 2
Do. Mud Bts. 8	.. 8
Dandeess, .. 34	.. 28
Coolies, .. 45	.. 38
Men 91	79

II. *Bahmunghata Canal.*

11. The Report of 1829 notices that a small portion (about 500 Choukas) of the Cut from Kantatulla to Ghoonamegee remained unfinished. This portion was completed at the time of my first visit to the Mofussil Canals in March, when I ordered the Bunds to be Cut away. I found it necessary to send a couple of the Mud Boats to assist in drawing the Piles

* The new Boat too, which was working near the first Lake Chokies was obliged to be brought into the Eastern Canal ten months ago, as the earth in the former place was found to be too hard for the buckets, which either scraped the surface only, or were torn to pieces by the resistance.

at the mouth of this Canal, and there still remains some of the Bund, causing a fall of water when the Tide runs out : this may be removed in the winter by one of the Dredgers. The expense incurred on this (the Bhojdiggee Canal) has amounted to Rs. 1,580 : 14 : 2½. This Cut has been very successful, as it carries the strong Tide of the Kantatulla Khal through it, and thence upwards by the North branch of the Doodhbeebee Khal ; so that there is little danger of its becoming filled up.

12. Of the Bahmunghatta Canal, properly so called, 3,700 feet were excavated and opened in the year 1828-9. . Before the 1st March 1830, 1,478 feet more were ready for measurement ; the remaining 860 feet were completed to the full depth of 12 feet, in April ; and the last 2,000 feet, (following the course of a small Nulla, which had to be widened and deepened,) was reported finished ere the rains set in. Illness prevented my then visiting the works, but I had taken the measurements up to the 15th May.

13. All that remains to be done in the Bahmunghata Canal, is to cut away the residue of six Bunds, the expense of which, if done as before proposed, is already provided for in the Dredging abstract.

14. The expense incurred has a little exceeded the Estimate, this is chiefly to be attributed to the heavy rains of March, April, and May, which continually flooded the works, injured the Bunds, and increased the expense of hutting the labourers.

15. The Tides of the Kantatulla and Tarda Khals are nearly simultaneous, so that they meet in the New Canal ; but as the numerous outlets to the Eastern half of the Lake, which were bunded during the excavation, can easily be re-opened, should the aspect of the Canal render a stronger current advisable, (a point I hope soon to ascertain by inspection,) I do not think it expedient to come before the Committee with a proposition to throw a Bund across the Kantatulla, as had at one time been suggested by the late Superintendent.

III. *Chytul Canal.*

16. This short Cut was recommended by the late Superintendent as a substitute for a longer route through very unfavorable country proposed by Captain Schaleh : my brother himself, however*, qualifies his recommendation by reminding the Committee, that “ a route still exists by the Aktratulla and Bairmaree Khals to connect the Bhuwaneeppoor Canal with Busera.” The Cut was sanctioned by the Committee, and nearly two-thirds were completed before I received charge. The direction taken passed through a Jheel, to the Eastward of which was a sand ridge of considerable width, rising 3 feet above the neighbouring levels. It was intended to excavate here to the depth of 14 feet, but the water rose so rapidly through the sand, while at the same time from the weather, and from a Bund having given way, the rest of the Canal was under water, that I imagined the expense of getting the bed dry with so little of the season before me, would be greater than was warrantable ; I therefore directed the Bunds to be partially cut away in April, leaving the average depth below the bed of the Jheel 6 feet. In May I found the Cut very servicable, with a depth of 7½ feet at high water, and a strong Flood Current setting through it from the Choumoooh to the Aktratulla Khal, and vice versâ, with the ebb. Notwithstanding, therefore, the disadvantage of the sandy spit, the shortness of the Chytul Canal ensures a rapidity of Tide which will keep it open, and even tend to cut it deeper than at present ; while from its passing through cultivated country, it will always be much frequented by Boats, the largest of which will find ample water to enter it at the top of the Flood, and it is useless to pass it at any other time, because the Choumoooh Khal must convey the craft up to the Canal with a rising Tide, and the Aktratulla must be descended as far as the Cheetpoor Khal and Bhuwaneeppoor Canal, with the Ebb.

* Report 1829.

17. At any rate, the choice of passing by the other route remains ; I see no reason therefore to recommend to the Committee that the Chytul works should be resumed at present, excepting so far as is necessary to clear the passage from Bunds, and throw it more completely open to the Currents, to and fro, of the Tide.

18. The disbursement upon this work was little more than half the estimated amount ; it is as well, however, that the balance should be held as disposable upon its completion, should it hereafter be deemed expedient to deepen its section, according to the original design.

IV. *Bayleygunj Canal.*

19. It was partly with a view of concentrating as many hands as possible upon this work, that I abandoned the Chytul Canal in April. It seemed to me very essential that the whole line should be completed in one season, as otherwise the higher level of a part of the bed might be expected to spread its contents over that newly excavated, and thus render it nearly as bad as before, for the earth of the Sunderbun alluvium is of so very soft and yielding a nature, that when moistened with water, it soon loses all traces of the spade, and acquires a level like treacle, or pitch. Unfortunately, however, the season was unpropitious, hardly once allowing the surface of the ground to be thoroughly dried before the cutting commenced : indeed, it was in many places rather *ladled out* than *dug*, and the labourers complained that it filled in from below as fast as they removed it. At one spot, for a length of 250 feet, where the excavation had been completed to the intended depth of 6 feet below the old bed, a sudden sliding in of the Banks occurred, which raised the bed $3\frac{1}{2}$ feet, after the water had been admitted upon it, and consequently when no remedy could be applied. Adjoining to the place just described, the section traversed a stratum of sand of 600 feet width. This again was excavated with some exertion to the depth of 4 feet, when the oozing of sand from below seemed to set at defiance all further endeavours. The rest of the Bayleygunj Canal was of a more promising character, and it maintained the full depth required ; namely, 10 feet below the surface, or high water level of the country.

20. There are then 875 feet run of this Canal still unexecuted to the requisite depth by from 3 to 4 feet : still I feel some hesitation in placing them in my schedule of works for the ensuing season, as I am by no means confident of the practicability of deepening such a soil in a permanent manner. It will be in the memory of the Committee, that this Canal has already been once filled in since it was executed by Captain Schalch in 1824-5, and I am inclined to attribute this gradual effect as much to the oozing upwards of the soft sandy matter of the soil, as to the operation of silting or deposition of matter held in suspension by the water, which passes through with less velocity, on account of the simultaneous Tides of the Kullooa Gung and the Bunbeebee Khal.

21. In the ensuing season, therefore, unless it is the opinion of the Committee that the whole line should be made of uniform depth if in any way practicable, I propose confining my operations at Bayleygunj to the removal of the Bunds ; watching the progress of the processes of deterioration in this Canal, in order if possible, to suggest some remedy. I would here beg leave to remark, that the Plan of Damming up the Kulloah Gung appears to have been very judicious in theory ; as from the large body of water in the Ishamuttee, as well as from its connection with the Ganges, there is a powerful Ebb Current passing hence through the Hoseinabad Canal, which would have served to keep both that and the Bayleygunj Canal open, had the Kullooa Dam been experimentally successful. It is the failure of this bold measure under the skilful and indefatigable exertions of my predecessor, which, together with the large outlay, prevents my recommending a renewal of the attempt.

22. Experience has, however, long since proved, that Captain Schalch's scheme of a permanent line of Canal crossing the upper ramifications of numerous Tideways cannot be maintained in such a soil as that of the Soondurbuns, with sufficient depth for the Navigation of large Boats; while ample evidence has been afforded, that it must soon become a series of Tide Channels passable only at high water. As long, however, as the apex (if I may so term it) of each section is situated at such a distance from the last as to occupy the period of one Tide nearly in the passage of a Boat from one to the other, there will be no great disadvantage in such a system. The Tide Navigation of the line of Canals, as far as the Eeshamuttee or Juboona River, may be disposed as follows:—

	Miles.	Hours.
<i>First Ebb.</i> —Start from the Eastern Canal through the Lake Channel and pass the <i>Bhamunghatta Cut</i> , before the Tide has fallen too low, to <i>Kantatulla</i> ,*	7	2½
Wait for change of Tide,	0	3
<i>First Flood.</i> —Enter the <i>Bhojdiggee Canal</i> , and reach <i>Bhungar Hat</i> by the High Water of ditto.	6	2½
Wait,	0	3
<i>Second Ebb.</i> —Moving on with the slack water of the <i>Chultareea Cut</i> , run down the <i>Beharee</i> and <i>Choumoo</i> Khals to the <i>Munduree</i> ; and if able to stem the Current, row up to the	12	11
<i>Second Flood.</i> — <i>Chytul</i> , cultivated land to pass the night,		One day
<i>Third Ebb.</i> —At high water pass the <i>Chytul Canal</i> , and descend the <i>Akratulla</i> to <i>Cheetpoor Khal Tirmuhanee</i> ,	5	2
Where wait for the flood,	0	3½
<i>Third Flood.</i> —Track or row through the slack water of the <i>Bhuwaneepoor</i> and <i>Bayleygunj</i> Canals as far as <i>Kulloah Gung</i> ,	4	2½
<i>Fourth Ebb.</i> —Run through the <i>Dansa Khal</i> and <i>Hoseinabad Cut</i> , and descend the <i>Ishamuttee</i> River to the mouth of the <i>Coxalee</i> or <i>Goodlad's Creek</i> ,	2 10	1 3
		Second day
	Miles 46	34

23. In the foregoing scheme, I have taken no account of the wind, and moreover have supposed the Craft heavy and of considerable draught. With a light Boat and favorable wind, the same space may be traversed even in a single day.† Still it must be confessed, that nothing is gained in point of *velocity* by the new route, although one-third shorter than the Old Soondurbun Passage; for the same Tides *partially* employed in the one case, will transport a Boat over the longer distance with equal facility.

24. The Navigation by the old route may be thus divided:

	Miles.	Hours.
<i>First Ebb.</i> —Start from Eastern Canal before Ebb commences so as to reach the mouth of the Attarabanka Khal by low water,	30	8
<i>First Flood.</i> —Traverse the Attarabanka to Rampoor,	10	4
<i>Second Ebb.</i> —Descend to the Raymungul Khal,	9	4
<i>Second Flood.</i> —Ascend the Nowyee and Bara Koolya to the mouth of the Coxalee or Goodlad Creek.	15	6
	64	22

* Should the Bhamunghata Cut not be passable, the same object may be attained by running on to Tarda, and there awaiting the Flood.

† Starting from Mundaree at midnight with a favorable wind, I reached Balya Ghat by 8 o'clock the following morning.

25. Hence it appears, that there is a loss of a whole day in pursuing the new route for all Boats of considerable draught, yet capable of using oars, such as Bauleahs, &c. Heavy Boats of burden would probably employ two Tides in reaching Attarabanka, and thus perform the lower passage in the same time as would be taken in the Canal route.

26. On the other hand, the advantages of the Canal Navigation are such, as to ensure it a preference over the deep and dangerous streams of the Soondurbun forests, even at a little loss in point of time, for the frail Boats which ply from the Eastward, laden with wood, lime, fish, rice, mats, thatch, vegetables, and passengers.

27. The annexed Statement (Appendix E.) shews, that an average of nearly 200 Boats per diem pass through the Bhaminghata Canal, (and consequently through the whole line, or at least from Mundaree,) varying in size from the Dingee to the 1000 maund Pulwar, during the month of September, when it must be remembered, the whole Navigation from the Ganges is diverted from the Soondurbun route ; so that it may be expected, that the traffic by the Canal will be at least doubled in the dry season. The greatest assistance is derived from the power of tracking along the Banks of the excavation, although it must be confessed, that the earth is piled in irregular hillocks in most places, without the convenience of an even pathway.

28. Among the items of my Schedule for the approaching season, I have ventured to insert a small Road Establishment of 50 Coolies, under a Jemadar and a couple of Peons, intended to be employed in levelling a footpath of sufficient width along one or both sides of the New Cuts ; and it would certainly add considerably to the utility of the Canal, could a similar convenience be extended to the different natural creeks forming the main portion of the line. As the first step thereto, the jungle on the Eastern Bank from *Mundaree* to *Chytul* might be cleared away, as this is a spot where tracking will always be resorted to, to gain the remainder of the Ebb or Flood in passing to the East or West.

29. As connected with the conveniences of the Canal, I beg leave to point out the advantage of establishing Villages and Bazars at suitable places, provided always that a clear space shall be left open next to the Canal for a Road. Applications have been made to myself at various times by the Ryuts for permission to erect villages at Kantatulla, Bhungur Haut, &c., but I have not felt myself empowered to grant it.

30. Ferries also at Hoseinabad, Bhatpota, Bhungur, &c. have from necessity been established, but I am not aware that any farm has been granted of them by the proper Officers of Government. Neither indeed has any Toll been yet levied upon Boats navigating the Canal. It will rest with the Committee to frame, for submission to Government, such a Table of Tolls as they may deem suitable to the circumstances of the traffic, bearing in mind, that the old route is accessible to all, and that therefore the rates should be proportionally less than if the whole passage were commanded. It may be also beneficial to allow the transit to be open for a period, that the advantages of the route may be fully appreciated before hand.*

31. In the foregoing remarks, I have taken it for granted, that the line of Mofussil Canals, which has been once thrown open to Navigation, is hereafter to remain so, or that the operations designed for the next season will not interrupt the passage of Boats : arguing on the supposition, that the bunds and other impediments may be removed by the Dredgers. Another visit will, however, enable me to speak with more confidence on the subject, as I have some doubts whether it will not be necessary to bund the small Khal connecting the Bayleygunj Canal with the Gobra Khal, for the purpose of removing a vast number of roots

* The only places at which it will be necessary to establish Chokies to command the whole line of Canals, are

1. The Western mouth of the Bhojdigee Canal.

2. The Ishamuttee entrance of the Hoseinabad Canal.

Half Toll may be taken at each, or where full Toll is taken, a pass ticket should be given.

and trunks of trees, from which it is rendered impassable at Low Water. The bed also may require to be deepened a few feet. As for the Chytul Canal, I have already pointed out that its being closed will not interfere with the rest of the Navigation.

32. I will now recapitulate the items of my proposed scheme of Mofussil operations for 1830-31.

1. Two Dredging Boats, at 550 per month,	Rs.	6,600	0	0
2. Probable Extra Expense in removing 16 Bunds, at 50 per Bund, ...		800	0	0
3. Establishment for levelling and making a Tracking Path, estimated at 250 per month,		1,500	0	0
4. Deepening the Chhota Gobra Khal and removing roots, &c. there- from, 600 running feet, at 2,		1,200	0	0
5. Clearing away Jungle and forming a Tracking Path from Mundaree to Chytul of $\frac{3}{4}$ mile,		1,000	0	0
Total Rs.		11,100	0	0

33. It has been usual to include among the Mofussil works, the repairs of the Eastern Canal Roads, and the construction of Water-courses thereto; but it seems more natural to class these with the operations of the Circular Canal, to which I shall now proceed to advert.

CIRCULAR CANAL.

1. *Suspension Bridges.*

34. The Masonry of the Narkooldunga and Manicktola Bridges was completed before the 1st February. The Chains were thrown across by Captain Baker in May, and these two Bridges were opened to the public in the beginning of the rainy season.

35. The charges of building have unfortunately been included under one general head, so that I am unable, without some trouble, to state, what each has separately cost. I will endeavour to make the distinction when the two other Bridges now in hand shall be also completed: that of the Bythukkhaneh Road is now ready for the Suspending Chains, &c.; and the Barrackpoor Road Bridge is nearly in the same state of forwardness.

36. I have ventured to make a few slight alterations in the Plan and Elevation of the latter Bridge, as will be seen by comparing the Plan now sent with that which accompanied the last yearly report, the chief differences are as follows:—

1. The width of the two carriage-ways has been increased from 12 to 13 feet, to allow additional strength in the standards for the support of the Chains, leaving $8\frac{1}{2}$ feet opening for the Roads.

2. The space between the two Bridges has been augmented from 4 to 6 feet, so as to allow of a foot-way between.

3. The Chains have been brought by Captain Baker to rest upon one bed, instead of being superposed, whereby the Upper Chain depended for support solely upon a cross beam above the Lower Chain.

4. As this Bridge forms a principal thoroughfare, and Bounds also the Chitpoor Basin, I have introduced the side stairs: they were designed indeed for all the Bridges, but do not seem urgently necessary elsewhere, the Banks being grassed and sloped instead.

5. From my communications with the Right Hon'ble the Governor General, I was induced to give an additional depth of 3 or 4 feet to the foundations of this Bridge, in case

of any eventual determination to deepen the Section of the Canal. The soil being an oozy sand, I was unable to penetrate to greater depth; and it will not be irrelevant here to remark, that this circumstance offers an almost insurmountable obstacle in the way of any Plan for deepening the Canal, as my brother himself pointed out in his Report upon Captain Schalch's original scheme.

37. The alterations above alluded to, will make a trifling addition to the Masonry abstract of this Bridge—more than compensated by the accommodation gained: still I expect to come within the Estimate, and, if approved, I would propose to build the Dum-Dum Road Bridge on a similar Plan. The excavations for the foundations of the latter Bridge have been delayed through the non-purchase of a small piece of ground, (No. 3, Division G,) through which it was proposed to conduct the temporary Road. The subject has been brought to the notice of the Committee on a former occasion.

38. In connection with the Bridges, may be conveniently introduced the side Drains to the several Roads leading from the City to the Canal. The only one of these completed, is the North Drain of the Narkooldanga Road: it is vaulted for the distance of 300 feet, having an interior Section of 7×6 feet. Three more of similar dimensions, but of less length, will be required, and an equal number of a smaller size; but I presume these necessary works have been included in the original scheme, and that no new Estimate is therefore necessary. Neither will it be requisite to advert to the sum entered into the yearly abstract as expenditure upon Bridges, &c., until the whole be completed; the present report being (for unfinished works) merely a statement of the progress made during the past year, and of the course to be pursued in the next.

2. Flood Gates.

39. The last Annual Report included the Flood Gates at Chitpoor among the operations for the ensuing season; but from the non-purchase of a portion of the ground, and from the season being already far advanced when I received charge, I deemed it prudent to postpone breaking ground until after the present rains, especially, as from the sandy nature of the soil, great difficulty might be expected in carrying the excavations to their requisite depth.

40. With regard to the Plan of the Locks and Bridges, I have perused with attention the observations made by my brother on the subject, and beg to record my acquiescence in the general principles laid down by himself for their construction. I have also before me, the one inch model alluded to in his last Report, to guide me in the execution of the work. Some few practical alterations may perhaps be suggested as the work proceeds, and the same argument, which induced me to deepen the foundations of the Bridges, will naturally oblige me to give even *greater* depth, if possible, to the foundations of the side and centre piers of the Locks; the floors however will remain at the level originally designed for them.

41. I observe that a second pair of River Gates has been introduced into the Plan since the Chunar Stones for the first pair were prepared. My connection with Benares will put it in my power to procure a second set without much difficulty.

42. Since Suspension Bridges have been adopted in every other part of the Canal, I am inclined to recommend that they should be substituted for the Wooden Draw Bridges at Chitpoor; all Boats entering the Canal will have to strike their masts, and it is of little

consequence whether they do so in the River or in the Basin. The Draw Bridges would have to be raised for every Boat, whether with or without masts, as they are fixed nearly on a level with the present Road; the Suspension Bridge might be elevated several feet, and thrown across the inner or Canal portion of the Locks, where the level of the water will always be maintained at the Zero of the guage.

43. The advantage of such a Bridge will be, that the Road communication of this great thoroughfare will remain uninterrupted; but the alteration requires to be more maturely considered before it can positively be proposed for the Committee's adoption.

3. Canal Excavations.

44. The number of Choukas of 729 cubic feet, brought to account this year has been 13,305, and the corresponding lineal measurement of Canal excavated, 6,083 running feet.

45. Of these excavations, 30 Lots, or 3,000 feet, complete the line from Sealdah to the Entallee Canal, so that the whole line from the unpurchased ground in Ooltadanga Southward, exhibits *superficially* an uninterrupted water communication.

46. Unfortunately, however, there are many unfinished Lots within this run, which will oblige me to lay a considerable portion of it dry again for excavation this winter. The accompanying Plan (Appendix F) points out the position of the impediments which are as follows:—

Lot Nos. 45, 46,	depth still uncut 6 feet,	ground purchased too late in season.
41, in part,	ditto, 12 feet,	temporary Bridge, Bythuckhana Road.
39, 40,	ditto, 7 to 8 feet,	ground purchased too late.
38,	ditto, 3 feet,	inactivity of Contractor Ramchund.
35, 37,	ditto, 5 feet,	ditto ditto.
12, 21,	ditto, 1 to 2½ feet,	unfinished Nos. of 1829.
1, 30,	ditto, 12 feet,	temporary Bridges, Narkooldanga and Maniktulla.
56, 57,	ditto, 13 feet,	unfinished Lots in Ooltadanga of 1829.

47. From the early rains this year, the finished Lots became so full of water in Ooltadanga, that at the first heavy fall on the 26th May, when the water poured in from all the City Drains, the partition Bunds all gave way, and a passage was at once opened into the Entallee Canal; this I had fully anticipated, but could have wished a few days delay to have enabled me to complete the excavations at once, leaving merely the remnants of Bunds to be hereafter Dredged away.

48. The direction of the excavations on the *North* Division of the Canal extended from the neighbourhood of the Dum-Dum Road Bridge, (with some interruptions as per margin), to Lot 27 of the Chitpoor Bason.

No. of Lot. Depth remaining to be Cut. Cause.

1	20	Not begun.
2	10	Unbought.
3	8	Ditto.
4 & ½	10	Ditto.
½ 12	20	Bridge.
16	4	Defaulter
20, 21, 22	8	Ditto.

A good deal of water accumulated in them, partly from the wetness of the season, and partly by oozing from below; the Division was finally flooded by the high Tides of the Hooghly entering through a branch of the Marhatta Ditch. This circumstance proved

useful in protecting the sandy Banks of the unfinished Lots from being Cut into ravines by the rain. I propose to make a further use of the Marhatta Ditch in draining the works when the River falls, by deepening the Ditch to the Low Water level of the River, and inserting a temporary Sluice Gate at the Chitpoor Bridge, whereby I shall be able to command the lowest level of the Ebb. As soon as the Chains of the Barrackpoor Road Bridge

are thrown across, and the temporary Road removed, the same means will serve to Drain Divisions H. and G., and save, in a great measure, the expense of baling. Indeed, for all portions of the Canal where a few feet only remain uncut, I should propose to postpone operations until the Locks themselves are completed, as they will furnish a means of laying dry the whole extent of the Canal, with the assistance of a Bund, where it opens into the Entallee Canal, or the latter into the Lake.

49. The average rate of cost per Chowka of 729 cubic feet has been 2 : 5 : 2½, or 0 : 2 : 2½ in excess of the rates of last year. The excess is due to the greater breadth of the Lots in the Chitpore Basin (180 feet,) for which no provision was made in the contracts with the Sirdars; but an understanding existed, that they should be remunerated for the extra labour. I settled with them at an advance of 4 annas per Chowka over the usual rates, which is as nearly as possible proportionate to the increase of labour from the extra distance.

50. During the present season, I hope to enter into contracts on more favorable terms than heretofore, partly from competition among the labourers as the work grows slack. and partly from my paying the Sirdars direct; or, if through the agency of a head Sirkar, with the direct understanding, that he shall take no more than half an anna dustoorree on all payments of this nature: whereas it is pretty clear, that he has hitherto taken a much larger proportion.

4. *Canal Roads.*

51. Although the construction of the Side Roads of the Canal did not form a specific item in the scheme laid down in the last Annual Report, I felt myself authorized by its inclusion in the original design of the Canal, to employ the parties of Coolies upon leveling the mounds of excavated earth during the season in which their other work was suspended. It was also very desirable, now that the Canal was in so advanced a state, to render the Banks accessible at once to the public. On the Eastern side of the Canal, the whole line of Road is thrown open, (with some few interruptions,) from Balyaghat to the unfinished Lots in Ooltadunga, because the slope of the country towards the Lake obviates the necessity of providing for the Drainage. On the Western side, the communication is still cut off by the several Drains of the Circular Road. It will be our first object to construct the Water-courses and Bridges required, and to throw open this Road also; but I shall need the instructions of the Committee as to whether it is the intention of Government, that either, or both of the Roads shall be made pukha. I have purposely retained a

height of 1½ feet above the lower Road or Wharf of the Canal, (as per marginal section,) in case it should be deemed advisable to leave the Roads kucha for the present; but to any who have witnessed the wretched state of the Kucha Road along

the Banks of the Eastern Canal during the rains, when indeed the passage of wheel-carriages is prohibited, it will appear almost indispensable to lay the New Roads, or that on the Town side at least, with brick and khooa. Anticipating the concurrence of the Committee in this measure, I have entered into contracts for the fabrication of 30 lakhs of Bricks at various places along the Banks. I would strongly recommend to the Committee, that the Southern Road of the Eastern Canal should also be made pukka; as from the omission of a Bridge at the debouche of the Circular Canal, the whole traffic will be driven to the opposite side: and it has been proved, that no measure of temporary repair, even with khooa, will place it in a durable and serviceable state.

52. A sum of Rs. 250 was sanctioned for small Water-courses on this Road, part of which only seems to have been expended. I propose to continue this object, increasing the

dimensions of the Drains, which seem hardly sufficient to carry off the water as it accumulates.

53. The cost of levelling and making the Kucha Roads of the Circular Canal has amounted to between 30 and 40 Rs. per 100 feet running; but as the work has been subsequent to the 30th June, the explanations will more properly find a place in next year's Report.

54. I believe I have now touched upon all the points which need any observation, in the present limited scope of the Canal Superintendency. Brick-making occurs as an item in the annual schedule; but as it is subsidiary to the Departments of Bridges and Roads, a separate notice is hardly requisite. My brother suggested, that the position of the Canal, and the quantity of excavated brick-earth encumbering its Banks, would render it an eligible site for a Government Brick-manufactory. Such a purpose may well be kept in view, unconnected with the Canal Superintendence, since what remains to be accomplished in the latter Department, will furnish ample employment for the present season.

55. The cost of a kiln of Bricks, nominally containing one Lakh, has been upon an average Rs. 340; but as out of each kiln a deduction must be made of 25,000 for Jhaina and unburnt Bricks, the price to be charged per Lakh upon the masonry abstracts will be Rs. 450.

56. For the present season, Contractors have come forward at lower rates than have been hitherto paid, but I do not feel thorough confidence in such reductions, although I shall naturally make the experiment.

5. *Balances.*

57. The amount of assignments in favor of the Circular Canal for 1829-30, including the Balance of the year preceding, was Rs. 1,73,111 : 7 : 2,* against which I have drawn to the extent of Rs. 1,04,607 : 7 : 2, up to the 30th June 1830. A large Balance therefore, both in this and the Mofussil Estimates, remains available before any new application need be submitted.

6. *Outstandings.*

58. Appendix C, exhibits a List of the Balances remaining to be recovered up to the 30th June. A part of these have stood over since 1826-27 : those under the head of "Bhowaneepoor Canal 1827-28," are involved in the clashing of two Head Sirkars, each disclaiming responsibility. The Balances for the year 1829-30, are merely nominal, as most of them will be included in the Monthly Abstracts subsequent to June. By way of affording a clearer view of the outstanding account, the magnitude of which might at first sight appear large, I have classified the items under the several different heads enumerated in the margin, whence it results that about 10,000

Outstandings.

Will be included in Canal Abstracts, Rs	686	0	5
Ditto Road Contracts,	1,340	4	2½
Ditto Masonry ditto,	4,469	11	3
Received in Cash since 1st July 1830, ..	731	15	¾
Amount of Decrees obtained in Courts, ..	1,215	6	3
Prosecutions now pending,	1,180	9	2
Recoverable upon prosecution,	572	7	5
Total deemed recoverable,	10,196	5	8½
Parties Dead,	161	6	4½
Cases of hardship,	267	2	1½
Desperate Balances,	1,555	13	5½
	<u>Rs. 1,984</u>	<u>6</u>	<u>0</u>

Rupees are recoverable, and 2,000 may be looked upon as doubtful; though many items of the latter List are by no means hopeless. I refrain from recommending that any sum should be passed to profit and loss until every effort shall have been tried for its liquidation.

* Of this sum Rs. 5,304 : 0 : 0 have been retransferred from the Collectorate to the General Treasury; but as the date has not been notified to the Canal Office, it still remains on the Books as a Balance of an assignment No. 51, (15th January 1827,) undrawn.

7. *Establishment.*

59. The last point to which it is my duty to advert in the present Report, is the fixed Establishment and Office of the Department.

60. As soon as the Mofussil operations of the season were brought to a close, the establishments connected with them were discharged, with the exception of a Chuprassee or two to assist the Sirkars in collecting the Outstanding Balances, and to keep a register of Boats traversing the Canals. Perceiving also, that there would be little occasion for more than occasional visits to the Soondurbun Canals, I at once reduced the establishment of Boats for the accommodation of the Superintendent; charging merely for the occasional hire of a Bhauleah, when employed for the purpose. As the Circular Canal works will in a short time become for the most part concentrated in the Shambazar and Chitpoor Divisions, I shall be enabled to effect proportionate reductions here also; but as the construction of the Lock Gates will need constant supervision, I may perhaps be compelled to take advantage of the permission allowed by Government, (as per Mr. Secretary Molony's Letter to the Canal Committee, dated 10th November 1829,) of engaging an active European or Native Mechanic on moderate salary, as an assistant or overseer in this work.

61. In the course of the foregoing Report, I have made no allusion whatever to operations beyond the Ishamuttee River, for two reasons:—1st, Because I conclude that the Government have suspended the prosecution of this branch of Major Schalch's design, until the success of the Western Division shall be fully ascertained; and, 2ndly, Because my duties in the Mint would at any rate render it out of my power to act as Superintendent of any works situated at such a distance from Calcutta.

JAMES PRINSEP,
Superintendent of Canals.

No. 128. a.⁽¹⁾

APPENDIX A.

CANAL DEPARTMENT, 1829-30.

General Abstract of Expenses for Muffussil Works, for the season of 1829-30, from 1st July to 30th June 1830.

*Working of Old Dredging Machine, from 1st July 1829,
to 30th June 1830—12 Months.*

To Workmen,	1,986	2	11½	
To twice caulking and repairing of Dredging and 4 Mud Boats, ...	813	8	11½	
To repairing Iron Works,	562	5	4	
To purchase of one Boat,	136	8	0	
To Contingencies,	440	13	10	
				3,939 7 1
Carried over				3,939 7 1

Brought forward, 3,939 7 1
*Working of New Dredging Machine, from 1st July 1829,
to 30th June 1830—12 Months.*

To Workmen,	Rs. 2,089 9 2
To once caulking and repairing of 4 Mud Boats, ...	58 10 6
To repairing Iron Works, ...	360 3 0
To Contingencies, ...	393 6 5½
	<hr/> 2,901 13 1½

*Bahaminghatta Canal, from ditto to ditto,
12 Months, 4,263 running feet, 2,474
Chowkas excavated.*

To Workmen for cutting Chowkas at 1/14 per Chowka, ...	4,334 12 0
To emptying Water, ...	684 4 0
To making and repairing Bunds, ...	1,829 4 3
To clearing Jungle, ...	345 4 0
To pinning in the Slope and Bunds, ...	85 6 0
To taking up Roots, ...	45 4 0
To opening the mouth of Canal, ...	68 12 0
To furnishing fresh Water to Workmen, ...	189 0 0
To Contingent, including Establishment and Coolies' Shed, ...	1,049 7 3
Average 3 : 7 : 10 per Chowka, ...	<hr/> 8,631 5 6

*Bhose [Bhoje] Digee Canal, running feet, 557½
Chowkas excavated.*

To Workmen for cutting Chowkas at 1 : 5 : 6 per Chowka, ...	749 5 1
To making Bunds, ...	440 10 4
To emptying Water, ...	43 14 0
To opening the mouth of Canal, ..	6 2 0
To Contingent, including Establishment, ...	340 14 9½
Average 2 : 13 : 4½ per Chowka, ...	<hr/> 1,580 14 2½
	<hr/> 10,212 3 8½

*Choytul Canal, 3,200 running feet, 2,140½ Chowkas
excavated.*

To Workmen for cutting Chowkas at 1 : 8 : 9 per Chowka, ...	3,307 15 9
To making Bunds, ...	251 6 0
To clearing Jungle, ...	99 12 0
To emptying Water, ..	166 2 0
To taking up Roots, ...	31 4 0
To furnishing fresh Water to Workmen, ...	78 0 0
To Contingent, including Establishment, ...	1,081 3 2½
Average 2 : 5 : 6 per Chowka, ...	<hr/> 5,015 10 11½
Carried over, ...	<hr/> 22,069 2 10½

Brought forward, 22,069 2 10½
Bayley Gunge Canal, deepened 6,775 running Feet, 2,060⁶/₁₆ Chowkas excavated.

To Workmen for cutting Chowkas at 1 : 14 : 3½

per Chowka, Rs. 3,902 2 2
 To making Bunds, 987 0 0

To clearing Jungle, 341 6 0
 To emptying Water, 606 0 0
 To taking up Roots, 29 14 0
 To furnishing fresh water to Workmen, .. 120 4 0
 To cutting sandy mud over the Autty, .. 315 6 0
 To Contingent including Establishment, .. 1,764 8 1½
 To wear and tear of Pumps, 145 15 7¼

8,212 7 10½

To Workmen opening the mouth of Bhowa-

neepore Canal, 277 4 0

Average rate 4 : 1 : 11 per Chowka, .. 8,489 11 10¾

Balyaghatta Road Drain.

To Materials, Bricks, &c. 30 7 3
 To Workmen, 13 12 11
 To Contingent, 0 11 0

44 15 2

Sicca Rupees, .. 30,603 13 11¼

E. E.

Contents received,

JAMES PRINSEP,

Superintendent of Canals.

No. 128. a.⁽²⁾

APPENDIX B.

CANAL DEPARTMENT, 1829-30.

General Abstract of Circular Canal, for the season 1829-30, from 1st August 1829 to 30th June 1830.

6,083 running ~~met~~, 14,357½ Chowkas excavated.

To Workmen for cutting Chowkas at 1 : 11 : 10½

per Chowka, 25,006 10 5½
 To emptying Water, 826 3 0
 To making Drains and Side Road, 607 4 3½

Carried over 26,440 1 9¼

Brought forward	2,440	1	9½
To pinning in the Slope of Canal and Drains,	218	10	0
To filling Tanks for Side Road,	40	2	0
To laying grass in the Slope of Canal, ..	62	0	0
To taking up Roots,	4	2	0
To making temporary Wooden Bridges, ..	500	8	9
To breaking down pukka small Bridges and removing Rubbish,	97	2	0
To removing earth from the Bank of Canal,	208	0	0
To making a Wind-mill for drawing Water,..	209	15	3¼
To cutting floors of Houses,	120	6	0
To making Side Bridges,	35	5	0½
To making a Stone Cart,	122	12	11¾
To cleaning mud from the bottom of Canal and clearing Drains,	116	12	0
To making and cutting Bunds,	73	11	6
To making a Flood Gate Mould, and expense for landing Chunar Stones,.. ..	336	12	3½
To making and repairing Sheds,	802	3	8¾
To Contingent, including baskets and establishment,	4,347	3	7½
Average rate 2 : 5 : 2¾ per Chowka, —————	33,735	12	11½

Expenses for Narculdanga, Manicktulla, Boytuckhana and Barrackpoor Road Bridges.

To 90,880 cubic feet of Masonry for Narculdanga and Manicktulla Bridges,	12,944	11	5
To making Road Way in both sides of ditto Bridges,	1,124	12	0
To filling earth in the wings of Bridges and Chain Piers,	416	5	10½
To making a small Side Bridge and Pukka Drains in the Boytuckhana and Narculdanga, 3,400 cubic feet Masonry,	478	10	10
To cutting Foundation of Boytuckhana and Barrackpoor Road Bridges,.. .. .	2,059	11	4½
To emptying water of Foundations,	208	13	0
To pinning in the Foundations,	599	10	8
To Contingent, including carriage of Bricks, &c. and making a Road for passing Hackeries from Sambazar to Manicktulla,	2,535	7	2
Average 22 : 6 : 1 per 100 cubic feet, —————	20,368	2	4
	54,103	15	3½
Sicca Rupees,	54,103	15	3½

(NOTE.) Amount as per Monthly Report of June 1830, 36,908 12 10½
Amount of 3 bills for Masonry Work of last year, August, September and October 1829, which is not included in the Report, 17,195 2 5

54,103 15 3½

JAMES PRINSEP,

Superintendent of Canals.

No. 128. a.⁽³⁾

APPENDIX C.

CANAL DEPARTMENT of 1829-30.

List of Outstanding Balances to 30th June 1830.

Names of Sirdars	Rs. As. Ps.	Rs. As. Ps.	REMARKS.
CHALTABARYA CANAL, 1826-27.			<i>Sirkar employed—Luckinarayun Mokerjee.</i>
Kishenmohun Sirkar,	215 1 4½		Received in August 1830.
Parbuttychurn Ghosal & Mud- doosoodun Chuckerbutty, .. }	78 13 9		Originally 150, half paid by Mudsoosoodun who is since dead, his partner is referred to the Magistrate of Barasett to come to a settlement.
Muneeruddee Sirdar,	247 3 8½		Has no assets, the Canal filled with water, and his coolies ran away.
Royemohun Doss,	112 4 3		He and his surety live in Calcutta, and will pay if prosecuted.
Takoor Doss Ghose,	240 5 4½		Was prosecuted and imprisoned for 3 months, hopeless case.
Tarachaund Roy,	251 1 1		A decree obtained in the Court of Requests.
Taranaechurn Bosoo and Mul- lookchaund Sirdar, }	423 4 3½		Ditto.
		1,601 1 10½	
BAHAMINGHATTA CANAL, 1827-28.			<i>Sirkar employed—Luckinarayun.</i>
Luckhun Sirdar,	161 6 4½		Lukhun is dead, his surety promises to bring the money in a few days and quash the prosecution in the Suburb Court.
Hissamdee Sirdar,	534 15 10		Papers handed to Mr. Waddington by late Superintendent, who wished to sue a warrant.
Sibchunder & Jugomohun Bosoo,	6 7 11		This defaulter has paid up 800, and begged to be excused the balance.
Emamdee Sirdar,	11 6 0		100 already paid, the Balance recoverable
Woodhub Sirdar,	538 0 10½		Decree obtained and property under seal, but vukeel ill just now.
Ramrutton Boyne,	2 0 6		Recoverable.
		1,254 5 6	
DITTO, 1828-29.			<i>Sirkar—Luckinarayun.</i>
Rugoonauth Doss,	10 0 0		Promised to pay 1st October
Ramrutton Boyne,	17 2 0		Sent a man to collect this.
Titto Sirdar,	23 14 2½		Received in August 1830.
Woodynarrain Mundle,	15 4 5		Sent a man to collect.
Royechurn and Kissenmohun, ..	104 4 9		Reduced from 309 recoverable.
Goluckchunder Banerjee,	95 7 3		47 Rs. paid in August 1830.
Ketabdee Sirdar,	209 7 10		Regular suit to be instituted.
Dhurnidhur and Fuckerma- humed Sirdar, }	357 3 9		He deposited the Potah of his house as security, but a suit and decree must be first obtained.
		832 12 2½	
BAHAMINGHATTA CANAL, 1829-30.			<i>Sirkar—Luckinarayun.</i>
Gobindpersaud Mundle,	18 10 5		A man sent to collect.
Haraund Sirdar,	8 11 0		Received in August 1830.
Sunnasee Sirdar,	0 0 0		
Rammohun Doss,	50 15 3		20 Rs. received in September 1830, balance will be paid in October.
		78 4 8	
BHOWANEEPOOR CANAL, 1827-28.			<i>Sirkars employed,</i>
Sitaram Moochee, &c... ..	8 0 3		<i>Gooroopursad, Luckinarayun's man.</i>
Junglee Gurramee,	36 15 4		<i>Hurnath Roy, Captain P's. man.</i>
2nd Gopaul Sirdar,	27 1 0		Gooroopursad Bonerjee was sent in January 1830, to recover these Balances
Hissamdee Sirdar,	45 7 4		He collected 40 Rupees and a few iron stores, he was taken ill and returned.
Nowabdee Sirdar,	41 12 6		
Mokim Sirdar,	28 8 6		
3rd Gopaul Sirdar,	55 3 3		
Jummut Sirdar,	67 0 2		Hurnath Roy lives in Govindpoor, Nudéya Zillah.
Akbar Sirdar,	30 8 9		
Carried over, ..	340 9 1	3,766 8 2½	

Names of Sirdars.	Rs.	As.	Ps.	Rs.	As.	Ps.	REMARKS.
BHOWANEEPOOR CANAL, 1827-28.—(Continued)							
Brought forward,....	340	9	1	3,766	8	2½	
Mokim Sirdar,	51	6	0				
Myzudin Sirdar,	49	6	6				
Doya Mundle,	3	4	2				
Bhojrub Sirdar,	57	0	3				
Ketabdee Sirdar,	39	5	0				
Mullookhund Sirdar, ..	12	12	6				
Keenoo Sirdar,	27	3	10				
Hazaree Sirdar,	8	15	3				
Sonye Sirdar,	12	2	0				
Chamoo Sirdar,	60	11	6				
Auzeemuddeen Sirdar, ..	150	9	11				
Bauker Sirdar,	21	4	10				
Hossenuddin Sirdar, ..	20	15	3				
Gorye Sirdar,	35	14	8				
5th Gopaul Sirdar,	19	13	7				
Haubizulla Sirdar,	23	0	0				
Joychunder Sirdar,	6	2	0				
Bungsee Sirdar,	0	2	5				
4th Gopaul Sirdar,	0	5	6				
				941	0	3	
BHOWANEEPOOR CANAL, 1828-29.							
Kunnye Sirdar,	21	14	11				
Emmamdee Sirdar,	10	0	0				
Mutteeulla Sirdar,	169	0	6				
Bholye Lohmahamed, ..	110	2	7				
Goluck Sirdar,	51	0	0				
Kistno Sirdar,	27	6	0				
Ramchand Sirdar,	24	15	10				
				414	7	10	
BAYLEYGUNGE CANAL, 1829-30.							
Sumus and Koosye,	0	11	6				
Kurrim and Cossim, ..	140	13	9				
Calachand Sirdar, ..	10	8	8				
Ramlochan Sirdar, ..	5	15	4				
Durpanarain Sirdar, ..	13	1	11				
Sreehurry Sirdar,	0	2	3				
Ramhurry and Co. Moochees, ..	5	5	6				
Netye and Buddo Sirdar, ..	27	11	1				
Pursoola Sirdar,	15	15	11				
Madaree Sirdar,	5	2	6				
Haubizulla Sirdar,	1	1	4				
Emandee Sirdar,	16	8	7				
				243	2	4	
KULLOORDAM.							
Lohmahamed Sirdar, ..	..	..	..	7	5	2½	
							More than this amount is due to this party for other works.
CHOYTUL CANAL.							
Ranmohun Sirdar, ....	..	..	..	12	4	0	
							Recoverable from Rajchunder.
							(315 Rs. received on account of these Balances in September.)
CIRCULAR CANAL, 1829-30.							
Manick Mookerjia,	138	5	10½				
Sittanauth Mookerjia, ..	52	8	0				
Damoodur Sirdar,	125	12	9½				
Sibchunder Chuckerbutty, ..	29	10	10½				
Ramjee Doss,	364	13	4½				
Ramchunder Sirdar,	351	15	6				
Cootub, Bricklayer Mistry, ..	2,549	14	5				
Nubin Sirdar,	50	0	0				
Palaram Sirdar,	180	6	3				
Soobul Sirdar,	2	9	3				
Carried over, ..	3,846	0	4	5,384	11	10½	
							Luckinarayun will be held responsible for all of these—almost all of which will come into the regular Masonry and other Contract Accounts.

Names of Sirdars.	Rs.	As.	Ps.	Rs.	As.	Ps.	REMARKS.
CIRCULAR CANAL, 1829-30. (Continued.)							
Brought forward,	3,846	0	4	5,384	11	10½	
Bindabun Sirdar,	74	5	10½				
Sutterghun, ..	25	11	6				
Ramhurry Ghose,	309	4	10½				
Cauloo Malick,	301	8	7½				
Joogul Sirdar,	64	11	9				
Hurrypersaud Sirkar,	82	10	9				
Gooroopersaud Bhuttacharge, ..	58	6	5				
Gungahurry Bhuttacharge,	91	0	0				
Khoa-breaking account,	209	0	0				
Bindabun—Soorkee-pounder, ..	600	0	0				
Cosseenaauth—Jhama ditto,	125	0	0				
Haran Sing—ditto, ..	75	0	0				
Bindabun and Cosseenaauth—do.	94	0	0				
Hurrypersaud—ditto, ..	50	0	0				
Ramhurry—Brickmaker,	48	4	3				
Ramjee Doss—ditto, ..	110	6	11				
Bachoo—Cartman,	50	0	0				
Enamdee—ditto,	586	8	7				
				6,795	15	10½	
Total, ....	..	..	..	12,180	11	8½	

JAMES PRINSEP,
Superintendent of Canals.

No. 128. a.⁽⁴⁾

APPENDIX D.

Comparison of the depth of water in the Eastern Canal on the 26th December 1827, and after Dredging on the 9th September 1830. N. B.—The Level of water at Koolya Bridge was 6 feet 1 inch on the first measurement, and 8 feet 3 inches the second ; 2 feet 2 inches has therefore been deducted from all the second measurement.

Place.	Average Depth, 26th December 1827.		Average Depth, 9th September 1830.		Difference.		
	Feet.	Inches.	Feet.	Inches.	Feet.	Inches.	
From Fish Bazar to } 500 feet, }	3	2	5	0	1	10	
500 to 1,000,	3	4	5	9	2	5	
1,000 to 1,500,	3	3½	6	0½	2	9	
1,500 to 2,000,	3	2½	6	2	2	11½	
2,000 to 2,500, ...	2	11	6	3	3	4	
2,500 to 3,000,	3	1½	6	7½	3	6	
3,000 to 3,500,	3	3½	5	9	2	5½	
3,500 to 4,000,	3	6	5	7½	2	1½	
4,000 to 4,500,	3	3	5	4½	2	1½	
4,500 to 5,000,	3	9	5	2	1	5	
Total 5,000 feet,				Average Feet.	2	Inches. 6	Deepened by the action of two Dredging Boats for 2½ years

JAMES PRINSEP,
Superintendent of Canals.

No. 128. a.⁽⁴⁾

Soundings taken in the Eastern Canal at every 100 feet from Kood Ghat to Koolya Bridge, on the 10th October 1830. The guage standing at 6 feet 1 inch on the 26th December 1827. This part of the Canal was deepened 4 feet by Chowka work in 1827.

Kood Ghat within Bund.	From Fish Bazar.		Kood Ghat within Bund.	From Fish Bazar.		
	5,100 feet.	6 1		300	5 10½	
	200	5 7		400	6 1½	
	300	5 4		500	5 10½	
	400	5 1		600	5 7	
	500	5 4		700	5 8	
	600	5 10		800	5 8	
	700	6 1		900	5 8	
	800	5 10		9,000	5 8	
	900	5 5		100	5 4	
	6,000	5 9		200	5 9	
	100	5 1		300	5 11	
	200	5 6		400	5 4	
	300	4 7	Mouth of New	500	3 8	} Filled by action of the New Canal.
	400	5 0	Canal, . . .	600	4 4	
	500	5 0		700	5 4	
	600	5 3		800	6 0½	
	700	4 7	Godown, . . .	900	6 1	
	800	4 10		10,000	6 4	
	900	5 4		100	6 4	
	7,000	5 1		200	6 5	
	100	6 1		300	6 6	
	200	5 7		400	6 4	
	300	5 7		500	6 6	
	400	5 10		600	6 7	
	500	5 3		700	6 5	
	600	5 9		800	6 1	
	700	5 7		900	5 5	
	800	5 7		11,000	5 5	
	900	5 11		100	6 1	
	8,000	5 9		200	6 1	
	100	5 7		300	6 1	
	200	5 8				

J. P.

No. 128. *a.*⁽⁵⁾

APPENDIX E.

Statement of Boats passing through the Bahminghatta Canal.

Date.	Large Boats.	Middle-sized.	Dingee Boats.	Saultee Boats.	Total.
September 1830.					
1	39	23	79	27	168
2	37	10	86	19	152
3	25	33	103	26	187
4	9	24	99	15	147
5	46	21	112	7	186
6	11	14	125	5	155
7	27	19	101	9	156
8	41	13	99	23	176
9	38	26	103	17	184
10	19	15	73	11	118
11	36	29	109	15	189
12	41	11	102	35	189
13	39	27	137	28	231
14	44	11	105	13	173
15	69	31	83	7	190
16	29	26	113	23	191
17	27	18	96	23	164
18	38	23	114	25	200
19	11	37	49	29	129
20	28	46	102	21	197
21	65	55	87	33	240

JAMES PRINSEP,
Superintendent of Canals.

No. 130.

No. 173.

To MAJOR J. N. JACKSON,

Member and Officiating Secretary, Canal Committee.

SIR,

I have deferred replying to your Letter, dated the until I should have revisited the Kullooar Gunj, and thus be better prepared to give an opinion on the subject of the proposed Dam.

2. I have already expressed my sentiments to the Committee, that the design was judicious; but the difficulty of execution and expense appeared to counterbalance the advantages to be hoped for from its accomplishment.

3. The general effect of a free communication between the Canal and so many broad Tide-streams, is to cause a rise and fall in each branch of the excavation to the full extent of the Tide-lift; thus at High-water giving ample water for the passage of the largest Craft, and at Low-water laying the bed nearly dry in many places. Provided the Cuts be not of too short intervals, such a state of things has its advantages. From Husunabad to the Cheetpoor Khal there are three Canals, intersected by two large Khals, the Kullooar and the Gobra, which serve alternately as feeders and drainers to the Bhuwaneepoor and Bayleygunj Canals. The whole united distance is but six miles, and is therefore capable of being traversed with ease on the top of one Flood Tide; the only inconvenience felt proceeding from the alternating Currents, which are however in some respects advantageous, as they equally effect the passage to or fro, although again from their greater velocity, these Floods oppose an obstacle to heavy Craft, which would be avoided by a Channel of greater length, and consequently of gentler slope.

4. There can be little doubt, that to place the Sundurbun Navigation upon the best footing as a Canal, the whole line should be divided into two branches: 1st, the Eastern branch reaching from Husunabad to Cheetpoor as above stated, six miles in length, passing the Kullooar Gunj and the Gobra Khal, which must be strongly bunded; 2nd, the Western branch extending from Kooltee to Bahmunghata, and intersecting the Doodbeebee Khal and Kanta Tulla in like manner firmly bunded; this line would have a length of 13 miles, and from the Tides of the Tarda Nala being earlier than those of the Kooltee, there would be a gentle Current to the West at the time of High-water, which would in a great measure prevent the deposition of silt; the same thing now happens while the Kanta Tulla terminates this Canal, and my recent inspection proves, that it has not materially suffered from deposition, although contrary to the hypothesis upon which Major Schalch's scheme was framed, the water of the Sundurbund Creeks appears every where to hold in suspense a notable portion of silt,* at least during the present season.

5. The question then of the Kullooar Dam resolves itself into the more general one, whether the New Navigation shall be that of a real Canal, or of a system of Tide passages as at present. To render it the former, will involve an expense of full 50,000 Rupees upon the three large Bunds, besides their constant protection from accidents. I mention this precaution from having just perceived, that the several Bunds of the Doodbeebee Khal have been entirely carried away during the last rainy season, although I imagined, that the stream in question had been permanently closed. The Zemindars have perhaps favored the re-opening, for the sake of the fisheries now established on the spot.

* 100 Cubic inches let fall 1 grain of deposit in the course of an hour's repose; this comprehended all the grosser particles. According to this Estimate, it would take 4,000 Tides, or 5½ years to raise the bed of the Canal 1 foot, by the process of deposition alone.

6. To retain the present system, obviously costs no further trouble, excepting in the unavoidable repairs which would be necessary in either case, and in the completion of an efficient tracking path to aid the Boats in stemming the stronger currents.

7. I am inclined, therefore, still to recommend the Committee to leave the works as at present, at least for a year or two, when a criterion may be formed of their success. Already the greater part of the Navigation has been attracted into the New Channel, and I encountered Boats of the largest size (1,000 Maunds) on my route. The Wood Boats from the Roymungul tell me, that they save three days in their trip, besides the diminution of danger. With a Bauleah I have before stated, that the saving in time would not be so manifest. I myself reached Husunabad by the old route in $2\frac{1}{2}$ Flood and 2 Ebb Tides, and returned in 3 Floods by the new passage.

8. Should the Committee adhere to their opinion in favor of Bunding, I beg to suggest, that the first experiment might be made with advantage upon the Kantatulla, which is somewhat smaller than the Kullooar Gunj, and more easy of access. The undertaking would require the whole of the present year for preliminary preparations, such as opening a Road through the wet marshy jungle; collecting a mound of earth on either side; preparing pile-drivers; and perhaps driving a row or two of the main piles. I should prefer the method of filling in the earth from the centre towards the sides, as the bed would then be raised more gradually, and with the same discharge of water, the task would be divided into two embankments of minor difficulty.

9. I perceive that the remains of the Kullooar Bund still occupy one-third of the width of that stream, and that the depth of the remainder is increased to about 32 feet at High-water. One circumstance may have rendered that undertaking more hazardous at the time than it would be at present; namely, that the Husunabad Canal was not then opened, and consequently the rise and fall of the Tide was felt in all its strength on one side of the Bund; whereas now, by the effect of this outlet, aided by the Bayleygunj Canal, the level of the water on the interior would approximate within a few feet of that of the Kullooar.

10. I beg leave once more to remind the Committee, that I should be unable to bestow an undivided attention upon a work at such a distance from Calcutta, and without it, there would be considerable risk of failure. As to an Estimate, I feel quite unequal to attempt one; and I can only submit, that the first experiment cost Rs. 15,000, and that it failed for want of hands; that therefore, even Rs. 20,000 would not be an unreasonable sum to enter into any calculation of the expediency of the measure.

I have the honor to be,

Sir,

Your most obedient servant,

BAHMUNGHATA WORKS,
3rd December, 1830.

JAMES PRINSEP, *Superintendent of Canals*

No. 131.

No. 174.

TO MAJOR J. N. JACKSON,

Member and Officiating Secretary of the Canal Committee.

SIR,

As a Supplement to the scheme of works for the season 1830-31, set forth in my late Report to the Committee, I beg leave to recommend, that the following be included as the result of my present visit of inspection:—

1st. The clearing away of the Jungle and making of a towing path from the mouth of the Bahmunghata Canal to the Tarda Khal, length 3,500 feet.

Estimated expense 1,000 Rupees.

The Boats have to force their way against both a reverse Ebb (if I may so call it, for the latter half of the Ebb runs up this Creek and through the Canal to Kantatulla,) and the first of the Flood, so as to reach the main Channel Tide which carries them to Calcutta.

The Road now in progress along the Banks of the Canal promises such advantage, that I propose to carry it through the Marshy Jungle at once to the Kantatulla and Boj-diggee.

2nd. The 1,200 feet of the Bahmunghata Canal which remained incomplete last season, although passable at High-water, are a great impediment to Navigation at Low-water, or half Tide. It will be therefore advisable to enclose this portion at once, and complete it to the requisite depth. This requires no new Estimate. The expence may be about Rs. 1,000.

3rd. In the Chultabarya Canal, for a space of 500 feet in length, the Banks (apparently a good sandy soil) have sunken in, and raised the bed of the Canal three feet. This forms the only impediment in the whole line to Craft of a large draught; but I know not how to remedy the evil without once more suspending the Navigation. I will try the Dredgers, but fear that the ground is too hard for them.

4. The Doodbeebee Khal, which was Bunded in three places, is again open: this should be closed without delay, and will cause an outlay of 500 Rupees.

5. The Chytul Canal has gained so much in section by the strong Currents through it, that it is quite unnecessary to do any thing further to it this season.

6. The 500 feet of the Bayleygunj Canal, of which one Chouka remained uncut last season, presents difficulties in consequence; but the Banks are of a sliding nature, and the bed sandy; if the attempt to deepen this is to be made, no time should be lost: the bed is dry at Low-water.

7. I have been obliged to put a new chain for the Dredger, in hand; as the one in use is no longer in a serviceable condition. This, with a new set of Buckets, will come to about Rs. 800.

I have the honor to be,

Sir,

Your most obedient servant,

JAMES PRINSEP, *Superintendent of Canals.*

BAHMUNGHATA,
3rd December, 1830.

No. 132.

No. 169.

TO THE SUB-TREASURER.

SIR,

The records, &c. of the Canal Committee's Office having this day been made over to the Secretary to the Military Board, agreeably to the orders of the Right Honorable the Governor General, as promulgated in the Government Gazette of the 16th instant, I have the honour to transmit herewith, per Debnarain Banoorjee, for deposit in the General Treasury, the sum of Sicca Rupees Ninety-seven and two annas, (97 Rs. 2 As.), being the amount proceeds from the sale of old materials and rents collected, the property of Government, from the line of the Circular or Ooltadangah Canal, up to this date.

I have &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
20th December, 1830.

(Signed) J. N. JACKSON,
Member performing the duty of Secretary,
Canal Committee.

NOTE.—The Municipal Committee do not think it necessary to print those Papers which have been omitted to be printed of the Index to Appendix H.—J. M.

NOTE.—The Municipal Committee have thought it necessary to print the following further Papers of the printed Index of Appendix H.
J. M.

No. 13.

No. 18.

To LIEUTENANT SCHALCH,
Superintendent of Canals

SIR,

The Canal Committee having had under their consideration and examination, the line of the proposed Canal between Koolna and the Eastern Canal, as laid down in the printed map, are of opinion that it would be extremely desirable to straighten the line between the following points—

1st. Between Bamunghatta and Cheltabaria.

2nd. Between Deacol and Banka.

I am therefore directed by the Canal Committee, to request you will do them the favor to give them in the fullest manner your sentiments on the points above adverted to, they will at the same time be glad to receive such suggestions as you may be able to offer, on the expediency of correcting any other parts of the projected line of Canal from Koolna towards Banka. The Committee request you will accompany any proposed alteration, with a specification of the additional expense that would thereby be incurred—forwarding plans of the revised line, in explanation of your suggestions.

I have the honor to be, &c.

CALCUTTA.

24th June, 1823.]

(Signed) J. N. JACKSON,
Secretary to the Canal Committee.

No. 15.

To CAPTAIN JACKSON,
*Assistant Quarter-Master General,
 Secretary to the Canal Committee.*

SIR,

In reply to your letter of the 10th ultimo, conveying the opinion of the Committee, that it would be desirable to straighten the line of the proposed Canals between Bamunghatta, and Cheltabaria, and between Deacol and Banka, and calling on me to state my sentiments on these points, I beg you will represent to the Committee, that, under the impression that the former of the two Canals, might be made at a comparatively trifling expenditure, I lately surveyed, and minutely examined the country between Bamunghatta and Cheltabaria, in order to ascertain the practicability of the measure, and the expense that would attend it.

I have now the honor of transmitting a map of the Country between the above mentioned places,* and of informing the Committee, that there are no local objections to the formation of a Canal, in the proposed direction, the ground being an uniform flat, raised about a foot above high water mark, with exception to that part lying between the two Nullahs, which flow from the Pooroob Dhapa, or Eastern Lake, which is inundated at high

* No. 1

water to a depth of from one to two feet, and is besides covered with the common low Sunderbund Jungle. The country being inundated in the manner I have described, is favorable for Canal operations, as less cutting will be required. The expense of clearing the Jungle I have before shewn to be very trifling. The direction of the Canal, I would propose to be that marked on the plan, passing between the Koorobarya and Byrampoor villages; it should join the present Sunderbund passage at the mouth of the Koorookhaul.

The length of the Canal, will therefore be five miles one furlong, the rise and fall of the tide when the Canal is opened, will be about seven feet; and as we may take the average height of the ground above high-water mark to be one foot, and allowing a depth of seven feet in the Canal at low water, the depth to be excavated will be fifteen feet. If the Canal be made with a breadth of eighty feet at low water, its section will be $1,222\frac{1}{2}$ square feet, and the cubic contents to be excavated will be 33,080,850 feet, or 45,379 Chowkas, which, at 1 R. 8 As. per Chowka, will amount to S. Rs. 68,068.

This estimate supposes the sides of the Canal to have a slope of one half feet horizontal to one perpendicular.

The above rate of 1 R. 8 As. is taken as an average between the first and second Chowka in depth.

Allowing a space to be cleared of 100 feet in breadth on each side of the Canal, the distance being one mile six furlongs, the expense of clearing the Jungle at 2 rupees the Beegah will amount to Sicca Rupees 390.

As the Canal will pass through three miles three furlongs of cultivated land, the price of which may be taken on an average at 10 Rs. a Beegah, the quantity of land required, will be 376 Beegahs, and will amount to Sa. Rs. 3,760. The whole expense of the Canal will therefore amount to Sicca Rupees 72,218.

The Committee will observe, however, that in the original estimate a sum of Sicca Rupees 9,124 is appropriated to bunding the Bedadoory Nullah from Narainpoor to Tardah; as this Nullah will be deserted on the formation of the Canal, the latter sum must be deducted from the former, in order to shew the expense that will ultimately be incurred in the improvement of this part of the line.

I have also the honor of laying before the Committee a map of the country between the Juboona river and Chowmooh Nullah.* I beg the attention of the Committee to an alteration I would propose on this part of the original plan, in consequence of my having lately been furnished with a more accurate map of the country by Ensign Prinsep, of the Engineers, who is at present engaged on a minute survey of the tract of country, lying in the direction of the intended Canals.

In this map both the original, and the proposed line of the connecting Canal, are laid down, the former joining the Chowmooh Nullah at Bussera, and the latter at the junction of the Teoree with the Chowmooh, about 3 miles to the Eastward of Bussera. By carrying the Canal from Husseinabad to the latter point, two miles of excavation will be saved, whereas the distance by the Canal, between Husseinabad and Bussera will be increased scarcely a mile. The estimate for the original Canal, 9 miles $3\frac{1}{4}$ furlongs in length, being 1,00,583 Rs. that for the proposed one of 7 miles 3 furlongs will amount to Sa. Rs. 78,601, consequently by adopting the proposed, instead of the original line, there will arise a saving of Sa. Rs. 21,982. If this saving be carried to the account of the Canal between Cheltabaria and Bamunghatta, the expense of which, after deducting 9,124 Rs. (the sum assigned for bunding the Bedadoory, as stated above) amounts to Sa. Rs. 63,094—the expense of the proposed alteration of the original plan, between the Juboona River and Calcutta, will therefore amount to Sa. Rupees 41,112.

It will be observed that the Canal now proposed between Husseinabad and Bussera passes through a greater extent of *jungle* than the *former* one. This does not, it appears to

me, form any objection, as, from a late conversation I have had with one of the principal Landholders in that neighbourhood, I have every reason to anticipate, through the means of the Canal, the speedy cultivation of the country lying to the Northward of it.

No other object will be gained by the proposed alteration in the direction of this Canal than the saving of expense before mentioned, but by the formation of the Canal from Bamunghatta to Cheltabaria, the route between these places will be shortened one half in point of distance, and 6 hours in time. The present passage from Tardah to the Salt Lake, which is extremely disagreeable, in consequence of its lying for the greater part through jungle, and from the strong current which sets down it from the Lake, during the Rainy Season, will be avoided by the adoption of the plan now proposed.

With regard to the Canal between Deacol and Banka, I beg you will inform the Committee, that I have not at present a sufficient local knowledge of the country in that direction to enable me to give a decided opinion on the subject.

In the beginning of next month, it is my intention to proceed into the Sunderbunds, to examine the state of the country in the direction of the Canals during the height of the rains; should it then be in my power, I shall endeavor to acquire such information, as will enable me to reply fully to this part of your communication.

I have the honor to be,

Sir,

Your obedient servant,

(Signed) J. AUG. SCHALCH, Lt.

Superintendent of Canals, and Agent for the

Preparation of Suspension Bridges.

(A True Copy)

J. JACKSON, Captain,

Secretary Canal Committee.

CALCUTTA,
25th July, 1823.

No. 16.

No. 39.

TO H. MACKENZIE, ESQ.

Secretary to the Government, Territorial Department.

SIR,

The Canal Committee having, during the course of their proceedings, had occasion to advert to the line of Canal towards Koolna, as originally proposed by Lieutenant Schaleh, were struck with the windings existing in it, and it appearing to them, that in an undertaking of so useful and important a nature, a line of Canal the most direct, and that would at the same time afford the most facile Navigation, was the most desirable to be adopted, they accordingly directed me to call upon Lieutenant Schaleh, to ascertain whether an improvement in the line between the undermentioned points, could not be suggested, viz. from Bamunghatta to Cheltabaria, and from Deacol to Banka, and while offering such suggestions, to state for the information of the Committee, what would be the increased or diminished expense of such alterations.

I have now the honor, by order of the Committee, to submit to you for the information of Government, the Copy of Lieutenant Schaleh's reply to the above communication,

together with Copies of the Plans therein adverted to—in the latter are exhibited, the line originally suggested, as also that, at present proposed to be adopted.

The Committee having fully considered the alteration proposed, beg to recommend its being carried into effect, as being calculated in every way, to improve the important undertakings entrusted to their management, particularly with reference to the saving of time not only in the passage of the tract immediately adverted to, but throughout the whole line of Canal, as the plan No. 1, will at once shew. The tide on leaving Baliaghat, will only take you as far as the junction of the present Channel with the Budadoory (where it becomes necessary to wait until the Flood makes) whereas by the proposed line, no obstacle would offer itself to Boats, going at once to Cheltabaria, and in the same manner throughout the whole of the Navigation to Koolna.

This saving of time, and improvement in the Navigation, the Committee consider more than sufficient to counterbalance the increased outlay, as estimated by the Superintendent of Canals.

The result of the examination, about to be* made by Lieutenant Schalch, between Deacol and Banka, shall be forwarded to Government, as soon as the report is received from that officer.

I have the honor to be,

Sir,

CALCUTTA,
30th July, 1823.

Your most obedient servant,
J. JACKSON, *Captain,*
Secretary Canal Committee.

No. 18.

No. 795.

TO CAPTAIN J. N. JACKSON,
Secretary to the Canal Committee.

Territorial Department. Revenue.

SIR,

I am directed by the Right Honorable the Governor General in Council to acknowledge the receipt of your letter dated the 30th ultimo, with its enclosures, relative to a proposed alteration in the direction of the Canals between Bamunghatta and Cheltabaria and that between Deacol and Banka.

2. The proposed cut between Bamunghatta and Cheltabaria, as exhibited in the plan No. 1, will obviously be a great improvement; and though the expense is considerable, (estimated at Sicca Rupees 63,094,) the Governor-General in Council fully concurs with the Committee in opinion that the charge will be more than compensated by the advantage.

3. The proposed change in the line of communication between the Chowmooah Nullah and the Juboonah, exhibited in the plan No. 2, by which a saving of Rupees 21,982 is expected to be secured, seems to be likewise judicious.

4. Both proposals therefore are authorized to be adopted.

I have, &c.

COUNCIL CHAMBER,
The 21st August, 1823.

(Signed) HOLT MACKENZIE,
Secretary to Government.

* The result never reported—but there is a notice in a communication from Major Schalch, dated 19th October 1824, (Appendix H. p. 16, line 6 from bottom) of a Survey by him between Deacol and Hoseinabad.—J. M.

No. 24.

To CAPTAIN JACKSON,

*Assistant Quarter Master General, and
Secretary to the Canal Committee.*

SIR,

I have the honor of enclosing, in order that they may be forwarded to the proper authorities, a few remarks on the effect the opening of the Hosseinabad Canal will probably have on the manufacture of Salt in its vicinity. In these I have endeavored to shew, that if timely notice be given to the manufacturers, no loss will arise to Government, in the Salt Revenue, from opening the above-mentioned Canal.

I expect this Canal will be excavated during the present Dry Season, and as the advances are not made by the Salt Agent, before the middle of November, he will have full time to make such arrangements as may appear to him advisable.

As Lieut. Prinsep has surveyed the whole of the Salt lands in question, and is in consequence intimately acquainted with the subject of the enclosed remarks, which indeed are chiefly drawn from his information, the Committee may probably deem it advisable to recommend, that his services be called for by the Salt Agent, to assist in the arrangements that officer may think proper to suggest.

CALCUTTA,
SUPT. OF CANALS' OFFICE.
12th Dec. 1823.

(Signed)

I have the honor to be, &c.,

J. AUG. SCHALCH, *Captain,*
*Superintendent of Canals, and Agent for the
preparation of Suspension Bridges.*

No. 24. a.

Remarks on the effect the Canal between Hosseinabad and Bussera, will have, when opened, on the manufacture of Salt in its vicinity, and the cultivation of the adjacent land—intended to shew the obstruction that arises to the extension of the cultivation of Jungle tracts from the present situation of the Desec Khulories, and the advantages that would arise both to the cultivation of the country, and the manufacture of a better description of Salt, by their removal to the Southern side of the Canal.

During the period the plan, for the formation of the line of Canals at the head of the Sunderbunds, was under the consideration of a Committee of investigation, a petition* was presented to Government, by the Commissioner of the Sunderbunds, from certain landholders in the vicinity of Taky on the Juboona river, praying that Government would interfere to prevent the excavation of the Canal proposed to connect the Juboona River at Hosseinabad with the Choumooa Nullah at Bussera.

The petition arose from the fears of the inhabitants on the Juboona River, near the above-mentioned places, that, on opening the Canal, a body of Salt water would thereby enter the Juboona River, which it was apprehended, might not only render the adjacent country extremely unhealthy, but throw it into jungle, to an extent proportionable to the influence of the Salt water.

That these fears were not without foundation, was known to me at the time the plan of the Canals was given into Government. I had however provided a remedy against the apprehended dangers, which appeared quite satisfactory to the Committee.

* See Appendix to Appendix G. p. clxii.—J. M.

It will be seen by the accompanying map, that the line of the Canal is intersected by the Kelloah Gong at the bazar, which is now establishing on its Eastern bank, called Bayleygunge. A considerable body of water flows up this Nullah; the section at Bayleygunge being 230 feet broad, and 24 feet deep at high water. The tide also flows earlier in this Nullah than in the Juboona River, consequently, were the two connected, the water of the former would flow into the latter, and the danger above-mentioned would probably ensue.

I proposed therefore to close this Nullah on the Southern side of the Canal by a bund E.; by doing this, the tide from the Juboona will enter the Canal and will meet the tide from the Gobra Khal, left open to supply the Canal with water, when, the united streams will flow up the Bhagoria or Chandpoor Khal—on the recession of the tide, therefore, the water will flow from the Canal into the Juboona, impregnated perhaps in a slight degree with salt, from its union with the water of the Gobra Nullah; but not in a degree sufficient to affect so large a stream as the Juboona. Should this however be found to be the case, it will become necessary to bund the Gobra Khal in the same manner as the Kelloah Gong, and allow the Canal to be supplied from the Chitpore Gong, still further to the westward.

But in these endeavours to secure the country adjacent to the Juboona River near the line of the Canals, from the injurious effects of the admission of Salt water into that stream, it follows that the country on the Northern bank of the Canal, will, to a certain distance from the Juboona, be overflowed by Fresh water, and consequently such lands will be rendered unfit for the manufacture of Salt; an alarm is therefore spread among the Salt contractors, interested in the Khulories on the above lands, and they are on the eve of presenting a petition to the Salt Agent against the formation of the Canals, on grounds diametrically opposite to those on which the former petition was founded.

I shall endeavour however to shew, that the Canal so far from being detrimental to the Salt interest in this quarter, will offer facilities for its improvement; at the same time that the measure proposed will remove a chief obstacle to the cultivation of this, as indeed, of every part of the Sunderbunds, where the manufacture of Salt is conducted on the same principles.

An inspection of the accompanying map will shew, at once, the barrier that is formed against the extension of cultivation by the Salt Grounds, A. B. C. D. E. F., the difficulty of passing which, by the cultivator, arises from the following cause. In order to render the jungle lands fit for agricultural purposes, it is necessary after clearing them, to surround them with a bund to keep out the Salt water, which, during the spring tides, would otherwise overflow and cover the ground to a depth of from 8 inches to a foot. In forming these bunds it becomes also necessary to close up a number of small streams with which the Sunderbunds are in every part intersected. One of these streams probably supplies a Khulorie with Salt water; the consequence therefore of its being closed, is, that a complaint is immediately made to the local officers of the Salt Agent, the bund is destroyed, the labours of the cultivator are fruitless, and he relinquishes the land to return, in a few years, to its former state of jungle; although I cannot speak positively to the fact, I feel convinced, that many parts I have surveyed, which bore evident marks of having been once cultivated, have been again thrown into jungle from this cause.

Lieut. Prinsep, who has derived considerable information on the present subject during his survey of the boundary of the Sunderbund jungle and of the estates in its vicinity, assures me he has been witness to many cases in which the position of the Salt works has been an hinderance* to Talookdars, who were otherwise anxious to clear the jungle adjoining their estates for the purposes of cultivation.

* This, it is understood, has all been obviated by an order, that no Salt shall be manufactured *North* of the Attarra Banka, or Lower Soonderbun route, to prevent the smuggling which takes place near cultivated tracts.—J. M.

That the situation of this description of Khulories is unfavourable to the manufacture of the best kinds of Salt, is evident from the fact, that the Salt of the Desee Khulories bears an inferior price to what is manufactured lower down in the Sunderbunds.

Upon a mature consideration of the question therefore, I cannot but anticipate considerable advantages from the removal of the Khulories above-mentioned, to the Southern bank of the Canal ; many of the disadvantages under which the Salt maker of these Khulories now suffers would disappear. He would, in the first instance, be on the banks of a Canal by which he would at times be supplied with food ; the ground contains a greater quantity of saline matter, from not being inundated with Fresh water during the rainy season ; and he will be nearer his supply of fuel, for it is an indisputable fact, that, although the Desee Khulories are on the verge of the jungle, wood, fit for boiling the Salt, cannot be procured at a less distance than 20 or 30 miles.

I do not apprehend that the Salt manufacturers will decline making Salt on the banks of the Canal. They will of course object at first to a removal, but if they are made to understand, before the advances are given them, the effect the Canal will have on their old Khulories, they will, it appears to me, willingly resort to the Canal ; the occupation is too lucrative to be hastily abandoned, and they will in a short time become sensible of the advantages of their new situation. They would leave behind them no stock, the implements required in Salt making being no more than a small hoe to scrape the Salt earth from the surface of the ground, and a rude litter composed of Bamboos, to carry it to the place where the brine is to be extracted ; and even the apparatus for extracting and boiling the brine, is a simple construction of mud and such shrubs as are procurable in every part of the Sunderbunds.

On the removal of the Khulories, the immediate cultivation of the country to the Northward of the Canal may be anticipated, which may extend even to the Southward of it, if the situation of the new Khulories be judiciously chosen.

(Signed) J. AUG. SCHALCH, *Captain,*

Superintendent of Canals.

CALCUTTA,

SUPERINTENDENT OF CANALS' OFFICE.

12th December, 1823.

No. 25.

No. 353.

TO CAPTAIN J. N. JACKSON,

Secretary to the Canal Committee.

Territorial Department. Salt.

SIR,

With reference to your letter of the 31st December, relative to the measures proposed by Captain Schalch, for opening the Canal between Hosseinabad and Busera, I am directed by the Right Honorable the Governor General in Council, to transmit to you the accompanying copies of a letter from the Board of Customs, Salt and Opium, and of its enclosure, from Mr. Barwell, together with copy of the letter this day addressed to them on the subject.

2. The Canal Committee will instruct Captain Schalch to cause the parcels of ground, specified by Mr. Barwell, to be cleared without delay.

3. The Original map which accompanied your letter, is herewith returned.

I am, &c.,

COUNCIL CHAMBER,
The 5th March, 1824.

(Signed)

HOLT MACKENZIE,

Secretary to the Government.

No. 25. a.

TO THE RIGHT HONORABLE LORD AMHERST,
Governor General in Council
&c. &c. &c.

Salt.

MY LORD,

With reference to Mr. Secretary Mackenzie's letter of the 17th ultimo, we have the honor to submit, for the information of Government, the accompanying report, dated the 12th instant, with the enclosures, from the Salt Agent of Jessore, relative to the measures proposed by Captain Schalch for preventing loss to the Salt manufacture, from opening the Canal, which is to connect the Juboona River at Hosseinabad with the Choumooa Nullah at Bussera.

2. The agent states, that by closing the Kelloah Gong at Ballygunge, to secure the Juboona from the admission into it of too great a body of the Salt water, the operation* of 152 Calaries, on the Northern bank of the projected Canal, will be destroyed; and that about 35 more will be rendered useless, in the event of the Gobrah Khaul being bunded—but he concurs in the opinion of the Superintendent of Canals, that all objections may be obviated by removing the Calaries to the Southern side of the Canal. Assistance, Mr. Barwell thinks, should be given towards clearing away the jungle for the reception of the Calaries, and to meet the expence of transferring their works, as well as the loss which he apprehends the manufacturers will suffer in the first instance; he suggests that one anna per maund should be paid, in addition to the existing rates, for the Salt made from the new Calaries, for one year after their establishment.

3. We have no doubt that Government will concur in the propriety of affording every aid to the parties in establishing the Calaries, and we would accordingly recommend, that Captain Schalch should be instructed to render this, and to cause the spots noticed in the 6th Paragraph of the Agent's letter (which seem to have been judiciously selected), to be cleared, at the public expence, for that purpose.

4. It does not occur to us, that it is either necessary or advisable to grant any enhancement of price for the Salt, since, even if there should be some deficiency in the produce at first, there can be no question, from the superior facilities secured to the manufacture, from the more abundant supply of fuel and Salt water, which will be available in the new lands, that the Calaries will ere long, be much more productive than they now are, and that an ample remuneration will be found in their improvement, for any trifling loss which may at first be incurred.

5. We beg to return the map transmitted with Mr. Mackenzie's Letter.

BOARD OF CUSTOMS,
 SALT AND OPIUM,
The 16th February, 1824.

We have, &c.
(Signed) J. P. LARKINS.
 H. SARGENT.

* All Salt works, it is stated, have since been removed to the South of the old Soondurbun route by the Attara Banka.—J. M.

No. 25. *a*₂.

To J. P. LARKINS,
 GEORGE CHESTER, } ESQUIRES.
 HENRY SARGENT, }

Board of Customs, Salt and Opium, Fort William.

GENTLEMEN,

I have the honor to acknowledge the receipt of your Secretary's letter of the 24th January last, with the several documents which accompanied it, directing me to furnish a communication of my sentiments on the measures proposed to be adopted by Captain Schalch, for guarding against any loss to the Salt manufacture, by opening the Canal at Hosseinabad.

2nd. The bunding of the Kelooagong Khall, would, by preventing the admission of Salt water to the Salt lands, destroy the operation of 152 Calaries, situated in Hoodahs Hosseinabad, Amlunee, and Myenadangh—and in the event of its being found necessary to shut up the Gobra Khall, the manufacture of about 35 more Calaries in Hoodah Hurricattee, would also be stopped.

3rd. The removal of these Calaries, however, to the South side of the Khall, will be extremely feasible, if some little assistance is afforded to the manufacturers; and I am inclined to concur in opinion with Captain Schalch, that eventually the Calaries would prove equally productive, if not more so, than the old ones. The resources for the manufacture, in an abundant supply of fuel and Salt water, would probably be more available, than where they are at present situated: the produce for the first two years, after their establishment, would probably be deficient, but after being worked for that time, there can be little doubt of their proving as productive, if not more so, than the old Calaries.

4th. The principal difficulty exists in clearing away the jungle from those places, where it is proposed to fix the Calaries, as the Sajeeneahs have not the means of meeting the expence, which such an operation would involve: I would beg therefore to propose, that Captain Schalch may be instructed to lend his assistance for this purpose, and that he may be furnished with instructions to that effect, at as early a period as practicable, as no time should be lost, in preparing the places for the Calaries, for the ensuing season.

5th. The removal of the Calaries to the South side of the Canal, admitting that the jungle is cleared for them, will probably subject the Sajeeneahs to some expence—for which one anna additional would be an equitable remuneration; and I would beg to recommend that the parties may receive 15 annas, for the first year, for every maund of Salt manufactured, in the new Calaries.

6th. The high ground at Chalkoonee, a place to the Southward of the Canal, might, if about 200 Beegahs of jungle were cleared by Captain Schalch's people, afford space for 90 or 100 Calaries—another spot situated between Hosseinabad and the Dansare Khall, South of the Canal, would hold 8—and there are waste lands at Hosseinabad and a place called Koolyadangah, which might, I understand, contain 40 or 50 more, making nearly the number that would be destroyed by shutting up the Kuboorgong [? Kulloar] Khall.

7th. The documents, which accompanied your Secretary's letter of the 24th of January, are herewith returned, and I beg leave to forward, at the same time, a copy and translation of a Derkhaust presented to me by the people concerned, for your information and instructions.

I have, &c.

(Signed)

R. C. BARWELL,

Agent, Salt Department.

JESSORE SALT OFFICE,
The 12th February, 1824.

APP. H.

N N

No. 25. b.

No. 352.

To BOARD OF CUSTOMS, SALT AND OPIUM.

Territorial Department. Salt.

GENTLEMEN,

I am directed, by the Right Honorable the Governor General in Council, to acknowledge the receipt of your letter of the 16th ultimo, with the several papers mentioned to accompany it, relative to the measures proposed by Captain Schalch for opening the Canal between Hosseinabad and Bussera.

2nd. On a consideration of these papers, His Lordship in Council is satisfied, that the temporary and partial inconvenience likely to result, from the closing of the Kellooah Gong, and as eventually proposed, of the Gobrah Khall, is not of sufficient moment to cause any hesitation in the execution of these works, if found necessary, for the purposes explained by Captain Schalch.

3rd. It is obviously desirable to avoid any increase of price, which it will not probably be easy to reduce after the cause has ceased. It seems however, to be quite proper that, as suggested by your Board, the occupants of the Kalaries, which will have to be deserted, should be assisted, in establishing new ones to the South of the Canal.

4th. Captain Schalch will accordingly be directed to cause the parcels of ground, specified by Mr. Barwell, to be cleared without delay.

5th. The Original Papers, which accompanied your letter, are herewith returned, copy of Mr. Barwell's letter being kept for record.

I have the honor to be, &c.

(Signed) HOLT MACKENZIE,

Secretary to the Government.

COUNCIL CHAMBER,
The 5th March, 1824.

*No. 34.

(No. 501.)

To W. MONEY,
H. SHAKESPEAR, } ESQUIRES,
AND
C. R. BARWELL, }

Canal Committee.

Territorial Department. Revenue.

GENTLEMEN,

I am directed by the Right Honorable the Governor General in Council, to transmit to you for report, the annexed copy of a letter from Mr. J. Jessop, dated the 9th instant, together with the paper mentioned to accompany it.

2nd. The immediate question is, how far Railways could be expediently substituted for any of the contemplated Canals, or otherwise be usefully introduced in this country. Mr. Jessop will probably be able to furnish you with more detailed information than is contained in these papers.

I am, &c.

(Signed) HOLT MACKENZIE.

Secretary to the Government.

COUNCIL CHAMBER,
The 19th May, 1825.

* See No. 38. No. 38. a. and No. 39. of this Appendix page — J. M.

No. 34. a.

(Copy.)

HOLT MACKENZIE, ESQ.

Secretary to the Government.

Territorial Department.

SIR,

I beg leave to enclose a report received from England, and would take the liberty to request you to peruse the same at your leisure. My object in thus addressing you is, to ascertain how far the Government may deem it expedient to adopt in this country the use of Railroads, with Locomotive Engines.

In suggesting a line of Railroads from Calcutta to Diamond Harbour, in lieu of the proposed Canal, I feel convinced that it would be a great saving to the Government, both in the formation and subsequent conveyance of goods.

In this assertion, I am supported by the enclosed report, and moreover, from the nature of the soil in this country, the cost of Puddling would render the difference of the expence, between cutting a Canal and laying a Railroad, even greater than is shewn in the report.

The explanation given in the enclosed is so satisfactory, that I deem it unnecessary to say anything further. I shall be happy to answer any enquiries the Government may please to make, and, if required, will undertake the survey of the road, and furnish an estimate accordingly.

I am, &c.

CLIVE STREET,
The 9th May, 1825.

(Signed)

GEO. JESSOP,

(A true Copy.)

(Signed)

HOLT MACKENZIE,

Secretary to the Government.

The 19th May, 1825.

No. 34. a.⁽¹⁾

TO THE COMMITTEE OF THE PROPOSED RAILWAY FROM CROMFORD
TO THE PEAK FOREST CANAL AT WHALEY BRIDGE.

GENTLEMEN,

Having completed the survey of the proposed Railway from Cromford to the Peak Forest Canal at Whaley, and prepared the plans necessary to enable you to proceed to Parliament in the next session; I now submit to you the estimate for a double line, formed from accurate admeasurements, of which the particulars are detailed in the accompanying paper, and the following is an abstract:—

	£.	s.	d.
Common Forming,	2,319	19	0
Cutting and Banking,	17,015	10	8
Face-walling to Embankments,	1,175	17	0
Bridges and Culverts,	1,633	10	0
Tunnel at Burbage,	5,700	0	0
Sloping,	7,656	0	0
Fencing,	6,400	0	0
Cast Iron Rails,	61,950	0	0
Blocks, Nails and laying down,	5,810	0	0
Land,	4,200	0	0
Houses and Compensations,	1,000	0	0
Wharfs and Warehouses,	2,000	0	0
Contingencies, at 10 per cent.	11,746	0	0
	<hr/>		
	£129,206	16	8
Steam Engines, &c., for the inclined planes,	20,000	0	0
	<hr/>		
	£149,206	16	8

Although I have made considerable allowance for the advance on iron and the probable rise of labour, yet the estimate does not exceed the sum originally stated as the probable expence.

In the direction of the Railway, I have not seen reason to make any material alteration from the course described in my former report, but to avoid the necessity of tunnelling through the high ground near Haven Lodge, I have made the Railway ascend an eleventh of an inch in a yard, after passing the embankment near Pike Wall, and continued that ascent for $3\frac{1}{4}$ miles, which leaves a deep cutting of 24 feet at the brow of the hill; this slight rise will not be attended by any inconvenience, as its obstruction to carriages will not be greater than is caused by the curves of the Railway; it will only require the precaution of laying the curves in this part perfectly level.

As the general opinion of Railways have been formed from those of long standing and imperfect construction, no public one on the new system being yet completed, their effect and advantage are probably much underrated, and it may be necessary that I should notice the improvement which has so greatly extended their utility, and given them so decided an advantage over all known modes of conveyance for expedition and economy combined with safety.

Every one is aware of the immense advantages that have accrued to this kingdom from the introduction of Steam Engines to our mines and manufactures, which, by giving cheapness and facility to labour, and by enabling one man to direct the power which performs the work of hundreds, has raised the country to its present distinguished pre-eminence; had any one ventured to predict it forty years ago, when these changes were in their infancy, there would have been some reason to disbelieve that so important an effect could be produced by a cause apparently so inadequate; but with the experience of the past, there can scarcely be a doubt, that these advantages will extend to our modes of conveyance, as it is only an application of the same principle, the substitution of a cheap and powerful mode of performing labour, in place of a more expensive one.

The mode of conveyance that most nearly assimilates to Railways, is Canals; but to them, the agency of steam cannot be available, as they are limited to the size of their loads and as regards utility, to the speed of conveyance; for to draw a load of 40 or 50 Tons with double the speed that is now done by one horse, could not be effected on a common Canal by any power, that can be applied.

The comparatively small expence of forming Railways, will be a cause of extending our resources and finding new channels for capital and industry, and would for ever have been neglected, if there were on the more expensive modes of Roads or Canals to resort to; the first being expensive in the carriage, the latter in the execution. But a Railway can, according to circumstances, be made at from a half to a fourth of the expence of a Canal,* and convey goods more cheaply, which would render them lucrative, when any other mode would be ruinous.

The old system of forming Railways, was to make them with a regular inclination, adapted to the natural declivity of the country through which they passed, so that a horse had to perform the labour of ascending, as well as [to] overcome the friction of the carriages (for beyond a very small rise a locomotive engine will not work to advantage); the improvement has been to separate, as far as possible, the mechanical power from the friction, concentrating the power at fixed points, where by means of stationary Steam engines applied to inclined planes, the ascents are overcome at once, leaving only the friction and the distance to be done by the Horse or the Locomotive Engines. A Railway on this system is therefore equally suited to a mountainous or a level country, and either Horses or Locomotive Engines may be

* A Canal to form the same connection as is proposed by the Railway, was estimated in October, 1810, by the late Mr. Rennie, to cost £650,000.

used upon it, (though not both with advantage at the same time, from their difference of velocity,) the waggons being drawn along by the Locomotive Engine, which derives its motion from contact and friction of the wheels against the rails, the wheels being attached directly to the Steam Engine.

Where a Railway is level, the power required to move the waggone is little more than the friction, which is found to amount to about a two-hundredth part of the weight to be conveyed; or in other words, a power of one pound applied in the direction of the motion, will draw forward 200 lbs.; but as this supposes all parts of a Railway to be equally perfect, it is right in practice not to calculate on more than 150 lbs.

The power to which a Locomotive Engine can be worked on a level Railway, by the friction of the wheels against the rails, before the wheels slide, or revolve, without advancing, varies under the circumstances of the weather; when the rails are wet, the friction is equal to 4.32 parts of the weight, and when dry 5.32; but practically a tenth part of the weight only should be calculated on, as the effective power. A Locomotive Engine of 10 horse power, will draw 120 Tons at the rate a draught horse generally travels, or 50 Tons at the rate of 6 miles in an hour. The engine requires the attendance of only a man and a boy, at a daily expense of 5s.: the Coals consumed in 10 hours, would be from 20 to 30 Cwt.;—therefore the expense altogether, would be less than 30s. per day, for which 50 Tons may be conveyed 60 miles in 10 hours, which is less than half a farthing per Ton, per mile: so that making ample allowance for delays, the return of the empty carriages, the cost and maintenance of the engines, and providing the waggons, the expenses are altogether inconsiderable. I may here remark, that the rate of travelling may be increased to surpass that of mail coaches, and that the Locomotive Engine will, as readily, convey 25 Tons (including its own weight) at the rate of 12 miles an hour, as double the weight, in twice the time.

It is more than 20 years since the Locomotive Engine, worked simply by the friction of its wheels, was used upon the Myrthyr Tydvil Railway in South Wales, but owing to the Railway being made on the old principal with a declivity, it had not the advantage that was expected. Its next application, was on the Railway from Mr. Brandling's collieries, near Leeds, where a cogged wheel worked into cogs upon the side of the Railway to propel the waggons; but in this instance the advantage was inconsiderable, from the same cause,—the ascent of the Railway. It was then introduced among the Newcastle collieries, and observation soon pointed out that it was most effective, as the Railway approached to a level, where ascents or descents were unavoidable: they were obviated by the introduction of inclined planes, up which the loaded waggons were drawn by stationary engines, or the loaded waggons descending, drew up the returning empty ones; their present degree of perfection has thus been gradually attained, and four or five years' experience, has fully proved their simplicity, cheapness, and regularity.

On the proposed Railway, where the ascents from Cromford, by four inclined planes, is nearly 1,000 feet, and the descent to the Peak Forest Canal, between 700 and 800 feet, by three others; the average cost of working each plane, will be about a half-penny per Ton.

When these very moderate expenses of carriage are considered, it furnishes an additional argument, in favour of the opinion I expressed in my former Report,—that a Railway, forming so important a connection between rich and populous districts, and with Canals which yield an abundant revenue, cannot be a speculation of hazard, but must be a secure and a lucrative mode of investing Capital.

I have, &c.

(Signed) JESIAS JESSOP.

BUTTERLEY HALL,
November 29th, 1824.

No. 56½.

No. 97.

To LIEUTENANT T. PRINSEP,

Superintendent of Canals.

SIR,

* See No. 56. b. and No. 56. b.(1) at pages 65 to 67, inclusive, of this Appendix—J. M.

I am directed by the Canal Committee, to acknowledge the receipt of your letter of the 20th of November, forwarding a Report* on the state of the Ballia Ghaut and Entally Canals, together with an estimate of the probable cost of excavating the same, to the depth of four (4) feet and re-sloping its banks.

2. As the Committee cannot take upon themselves to purchase the lands, required to afford you additional breadth for re-sloping the banks, without a reference to Government, I am instructed to acquaint you, that a copy of your Report and Estimate, have been submitted for the consideration and orders of the Right Honorable the Vice-President in Council; in the meantime, however, with a view to avoid delay at this season, in advancing the progress of the work, the Committee authorize your making out receipts, for the Collector of the 24-Pergunnahs, for the sum of Sa. Rs. 1,000 (one thousand,) to be paid from the balance in his hands, of Sa. Rs. 3,785, for the purpose of clearing and deepening the Entally Canal.

3. This sum, the Committee apprehend, will be sufficient to enable you to commence excavating by sections, in the manner proposed by you; and until a reply can be received from Government, to the reference made to them.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
5th December, 1826.

I have, &c.
(Signed) J. N. JACKSON,
Secretary, Canal Committee.

No. 64.

No. 17.

To CAPTAIN J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

SIR,

Since my last communication with the Committee, I have, in anticipation of the sanction of Government to the General Scheme of Operations, sanctioned in their Order of 19th October 1826, made a particular survey, of the most judicious course to be given to the Chultabarya Canal, which I have accordingly staked out and divided into lots for contract. I have the honour to enclose a sketch of the spot, from which the Committee will perceive, that the length of excavation required, will exceed my supposed length of 1½ mile, being 11,700 feet, in consequence of my rejecting the part of the old Bungur Nullah, west of the dam at A to D. This Nullah appears to have filled up considerably since its survey by Major Schalech, from its being annually dammed up in 3 places, during 3 months. The small Nullah originating at B, below Chultabarya, is too inconsiderable to be of any advantage. The Tarda Bidyadhuree, which is likewise dammed up above and below Chultabarya, appears to be daily losing its depth of water, and I apprehend; that the portion of it required for our Canal of communication with the Lake, will require something, to make it sufficient for the purposes of navigation.

SURVEY
along the
Course of the
BUNGUR KHAL

*/Signed/ Thos. Prinsep Lt. Eng^r
16.th Jan^y 1827.*



Upon this portion of my scheme, I shall therefore, necessarily, much exceed my estimate of 15,000 Rupees; as, however, I expect to expend much less than my estimate upon another part, viz.—the Kullooar Dam, and opening of the Hosseinabad cut, which depends upon its execution, the aggregate amount of yearly expenditure is still likely to be, as estimated, within 50,000;* a further reference to Government on the subject, will therefore scarce be necessary.

* In my Estimate and the report No. 134, accompanying it, an error was made of 10,000, in the addition—for 32,707 : 8, read 42,707 : 8—and for 40,000 in paragraph 3, read 50,000.

With regard to the Kullooar Dam, I fear the season has too far advanced, to allow of its being carried into execution with any economy, or even stability. The salt tides are too powerful, from January to May. The season for its execution is October, November and December, when the tides, to my knowledge, are slack in all Sunderbund Nullahs, not immediately connected with fresh water rivers. Some money must be expended in making necessary preparations, the completion, however, must, I fear, be deferred till next November.

4th. I have the honor to suggest to the Committee, the propriety of apprising the Collector of 24-Pergunnahs, of my having marked out the ground of the Chultabarya Canal, in order that the same may be officially measured and appraised by an ameen, deputed for the purpose.

I have likewise the honor to forward two receipts in duplicate, upon the Collector of Calcutta for 5,000 Rupees each, upon the assignment No. 51 of 1826-27, now in the hands of the Committee: that no delay may occur in giving the advances for Mufussil operation, I have to request, the earliest period for its counter-signature.

I have, &c.

CALCUTTA,
SUPERINTENDENT CANAL'S OFFICE.
20th January, 1827.

(Signed) THOS. PRINSEP, *Lt. Eng.*
Superintendent of Canals.
(True Copy.) J. N. JACKSON.

No. 68.

No. 22.

To H. T. PRINSEP, ESQ.

Acting Secretary to Government.

SIR,

I have the honor, by desire of the Canal Committee, to submit for the information of the Right Honorable the Vice-President in Council, the annexed copy of a letter⁽¹⁾ and of its enclosure, dated the 19th instant, from the Board of Revenue, being in reply to a reference made by the Committee, in conformity with the instructions of Government of the 29th ultimo,⁽²⁾ on the subject of the quantity of ground, originally purchased by Government, on account of the Balliaghaut and Entally Canal and Roadways.

(1) (2) See pages 70 and 71 inclusive, of this Appendix No. 63, and No. 63 a.—J. M.

By the Board's letter, it would appear that, in addition to the quantity of ground obtained for the Canal, itself being 90 feet in breadth, a further space of 30 feet on each side had been purchased and assigned for Roadways, which will admit of a sacrifice to the extent deemed necessary by Lieutenant Prinsep, for widening and re-sloping the banks of the Canal of about 8 feet on each side. The Committee, with reference to paragraphs 2nd and 3rd of their letters of the 2d ultimo,⁽³⁾ would again recommend to the particular attention of Government, the plan proposed by Lieutenant Prinsep, and submitted with my letter above alluded to.

(3) See No. 5.

I have, &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA,
29th January, 1827.

(Signed) J. N. JACKSON,
Secretary Canal Committee.

No. 69.

No. 280.

To MAJOR JACKSON,
Secretary to the Canal Committee.

Territorial Department. Revenue.

SIR,

I am directed by the Right Honorable the Vice-President in Council, to acknowledge the receipt of your letter, dated the 29th ultimo, with its enclosures, relative to the Plan suggested by Lieutenant Prinsep for widening the Balliaghaut and Entally Canal.

2d. His Lordship in Council remarks,—that the Plan has been already approved, and the expense sanctioned,* with the reservation of the amount estimated as the price of further ground on either side—which, from your present letter, seems not to be required: under these circumstances, no delay need occur in executing the improvements proposed by the Superintendent of Canals.

J. M.
 No. 59—

COUNCIL CHAMBER,
 The 8th February, 1827.

I have, &c.
 (Signed) H. T. PRINSEP,
Acting Secretary to the Government.

No. 70.

No. 281.

To MAJOR JACKSON,
Secretary to the Canal Committee.

Territorial Department. Revenue.

SIR,

I am directed to acknowledge the receipt of your letter, dated the 29th ultimo, with the report⁽¹⁾ and sketch, submitted by the Superintendent of Canals, on the subject of the Chultabarya Canal, and to request that you will inform the Committee, that the Vice-President in Council approves the plan on which it is now proposed to execute that Canal, in modification of that sanctioned on the 29th December⁽²⁾ [? January] last, and authorizes the appropriation of a portion of the expense, sanctioned for completing the unfinished cuts from Hooseinabad with the Kulloar dam, to the purposes of the Chultabarya Canal, as suggested by Lieutenant Prinsep.

(1) See page 144,
 of this App. No.
 64—J. M.

(2) No. 70, of
 Index to Appen-
 dix (H)—J. M.

COUNCIL CHAMBER,
 The 8th February, 1827.

I am, &c.
 (Signed) H. T. PRINSEP,
Acting Secretary to the Government.

No. 71 $\frac{1}{2}$.

No. 32.

To LIEUT. T. PRINSEP,

Superintendent of Canals.

SIR,

In continuation of my letter No. 97 of the 5th December last, relative to the measures proposed by you for widening and deepening the Ballia Ghaut and Entally Canal, I have now the honor, by desire of the Canal Committee, to transmit for your information and guidance, the annexed copy of a letter⁽¹⁾ and of its enclosure from the Board of Revenue, dated the 19th January, and with advertence thereto, and to the plan proposed by you in paras. 2d, 4th, and 8th of your Report⁽²⁾ of the 20th November last, I am directed to inform you that, the Correspondence which has passed on this subject having been laid⁽³⁾ before the Right Hon'ble the Vice-President in Council, His Lordship has been pleased to sanction [the] immediate execution of the work in the manner suggested by you in the Report above alluded to.

(1) Printed as No. 63 and 63 a, in this Appendix at page 70.—J. M.
(2) See No 50 b, of this Appendix page 65.—J. M.
(3) See No. 56 of Index to App. (H) and No. 68 of App. H, page 145.

I have, &c.

(Signed)

J. N. JACKSON,

Secretary Canal Committee.

CANAL COMMITTEE'S OFFICE,

CALCUTTA,

19th February, 1827.

No. 72.

No. 36.

To MAJOR J. N. JACKSON, A. Q. A. G.

Secretary to the Canal Committee.

SIR,

With reference to the orders contained in your letter⁽¹⁾ No. 32 of 19th February, I have the honor to inform the Committee, that having now prepared with the assistance of Private Turner, an accurately detailed Survey⁽²⁾ of the Eastern Canal, showing the existing boundaries of the several properties adjoining, I am able to offer more matured propositions regarding it, and likewise to state with certainty, where any encroachment has been made upon the original 150 feet in breadth, purchased by Mr. J. Shakespear, in 1807-8.

(1) See No. 71 $\frac{1}{2}$ of this Appendix.

(2) The Survey in original, is lodged in the office of the Military Board.—J. M.

The general breadth of the Canal and Roadways at present exceeds 150 feet, and the encroachments in, as far as I can trace them, have been very inconsiderable in amount—less than one bigga, as seen in the enclosed list. It is still uncertain, whether the want of breadth in these places proceeds from such cause, as in so many other places it exceeds 150 feet.

The orders of the Committee, appear to have been written with the impression, that, upon survey, it would be in our power to recover 30 feet on each bank, for the purpose of a road. In many parts of the Canal where there is still 30 feet of roadway, the slope is so steep, that for security against its mouldering into the bed of the Nullah, it is necessary to sacrifice, in some places, 10 to 15 feet agreeably to my former proposition for scraping it to a slope of double its height. There are many parts of the road where the slope is very steep,

and the breadth of roadway scarce 20 feet. From the Coolya Bridge, westward, along the south bank, the road exists only as far as Mr. Williams' property, beyond which, there is scarce a pathway; the whole of the bank along this part is steep.

The chief object in giving a good slope to the bank, is to prevent the mouldering of its surface, falling into the still water of the Nullah, from filling up the Channel, and by this means, obviating one of the causes of the constant obstructions to the navigation. The principal steep parts are on the south bank from the bridge west, where there is no road from the point A to B, where the road has only 17 to 24 feet breadth, and C to D, where the road has 30 feet mean. I am at present engaged in scraping the latter division, and shall have a road average 22, at the narrowest 12 feet.

The principal thoroughfare, and all the principal Bazars and store Godowns, are on the north bank, and I should consider 20 to 24 feet, quite sufficient breadth for the roadway on the south bank, and that it is not absolutely necessary at present to open, by purchase, the road from the bridge west, in as much as there are no Godowns in this part, and the thoroughfare is not indispensable to the traffic. In the second division from A to B, the breadth of the present roadway is too narrow, to allow me to cut away any part of it for a good slope, and if such is ordered by the Committee, purchases to the average of 10 feet in width will be necessary, as per account enclosed.

Before however, I urge the Committee to recommend such a measure, I am induced to bring to their notice, one that appears to offer more immediate advantage and utility, and although, perhaps, it is not legitimately an object for the funds of the Canal Department, it appears to be most essential to the perfection of the Canal under their Superintendence.

Nearly the whole landing of goods and cartage of the trade, appears to be confined to the north bank, on which the great body of Godowns are built—on the opening of the new Canal, the Godowns, from its* disembogement eastward, will be glad to remove to the ground which will be offered for sale or rent, on the west bank of the new Canal, between its mouth and the Balyaghaut road, after which, the great thoroughfare will be confined to the part between the junction of the new Canal and the Dhurrumtolla.

During the progress of the present operations, the want of tenacity in the soil, has appeared to me so evident, that I am greatly apprehensive the turfing will not be sufficient to preserve it from decay, and in fact, along this part of the Canal, where the landing of lime, rice, and firewood, is so constantly carried on, the turfing would be of no use, in as much as vegetation will not thrive. The present road along this part is almost impassable in any season, quite so during [the] rains; and as the whole washing of this road, have hitherto, fallen into the Canal, I should say, that more *silt* has been accumulated from this, than from all other parts of the Canal. A pukka road sloped towards a 2 feet drain,† carried along its land side, with proper arched exits below the road, where there do not exist any exits for the purpose, would effectually remedy this—and likewise save any farther attention to the slope, and is so obviously beneficial a measure in every respect, that I am induced to forward an estimate* of the expense that would attend its construction.

At the same time I have to remark, that in case the measure is not approved, the present state of the road will make it absolutely necessary to do something, and that as a cutcha road with its slope, will require a greater breadth, the expense of purchasing ground will exceed that for one of pukka, I have added to the length of road, that of the road through the great firewood bazar, 800 feet in length, and 200 feet to communicate the end of the road with the pukka road at Mowlaally Durga.—The total length is thus 6150.

In my operations upon the Eastern Canal, I have found myself able to extend the excavating of the additional depth of 4 feet to a distance of 2000 feet beyond my estimated length, and where I then supposed from the very slimy nature of the bed, that dredging only was practicable, I shall therefore exceed my estimate upon this item. The difference

* Sic original.—
J. M.

† See Nos. 175 a. (1)
176, 183, 183 a.
and 184, of App. to
App. H.

* See No. 72 c.

will, I believe, be made up by the work upon the slope, which cannot be done with the present limited breadth of road, and the total amount remain the same as the original estimate.

I forward enclosed, besides the Estimate for 6150 feet of pukka road, an account No. 1, of apparent encroachment upon the Company's property—an account No. 2* of the ground required to be purchased to give a breadth to the two divisions A to B, and C to D, of the road on the south bank. I have not forwarded any account of what would be required on the south bank from the bridge westward to open the road A; I consider it not immediately necessary.

* See No. 72 a. and No. 72 c. of this Appendix.—J. M.

I have, &c.

CALCUTTA,
SUPERINTENDENT CANAL'S OFFICE,
19th March, 1827.

(Signed) THOS. PRINSEP, Lt. Eng.
Superintendent of Canals.

No. 72. a.

No. 1.

A List of encroachments† that appear from the present breadth to have been made upon the Honorable Company's land along the banks of the Ballia Ghaut and Entally Canals, South bank.

† See No. 191 of App. to App H.—J. M.

West of Koolya Bridge,	Length	Breadth.
Mr. Markage, (20 feet of west end,) ..	$280 \times \frac{20}{2} =$	2800
Capt. Burke, 10 feet,	$240 \times 10 =$	2400
Noorden Durjee, unknown—bounds being un- defined and their being no Pathway at all. }		
Gonsalves,	$150 \times 10 =$	1500
Beebee Shaw, east corner, 10 feet, .. .	$118 \times \frac{10}{2} =$	590
Property opposite Beebee Jan, where 60 feet was purchased, 40 remains,	$170 \times 20 =$	3400
	—	10,690

East of Bridge.

Ramut Mistry, a pukka Godown,	$140 \times 6 =$	840
A Mosque on Dr. Henry's ground, apparently built on excavation earth,	$200 \times 10 =$	2000
	—	2,840
	—	13,530

Biggas. Cottahs. Chittacks.

„ 18 $12\frac{3}{2}$

CALCUTTA,
CANAL'S SUPT. OFFICE,
19th March, 1827.

(Signed) THOMAS PRINSEP, Lt. Eng.
Superintendent of Canals

No. 72. c.

No. 2.

Estimate of Expense in widening and laying a Pucka Road of 24 feet breadth, from the Combogueement of the Ooltadangah Canal westward, to the Dhurruntulla main exit, with a 2 feet drain on the land side.*

Purchase of ground necessary to complete 27 feet in width, from Koolya Bridge westward.

	L.	B.	Sqr. feet.
Mr. Nicholson's garden and wall,	150	$\times \frac{20}{2}$	1,500
Mr. Crawley's property,	600	$\times 8$	4,800
Kimabor,	300	$\times 5$	1,500
Kino Mistree,	130	$\times 5$	650
Rajub Jammadar,	110	$\times 10$	1,100
			9,550
		Cottahs.	Chts.
		or 13	$4\frac{1}{4}$
		@ 100 per Cottah,	1,326 9 0

On the Company's property where the road is not 10 feet,
the knocking down of 19 Huts belonging to renters will
be necessary, estimated remuneration @ 20. } 380 0 0

Pucka Road.

Length from Bridge Eastward to new Canal,	1,800
Do. Do. Westward to Road,	3,350
End uniting to Mowlalleel's Durgu Road,	200
Road through the wood bazar to Circular Road,	800
Total length,	6,150
6,150 Running feet \times 27 feet breadth,	16,650
24 feet road 3 feet for drain, @ 7 $\frac{1}{2}$ 0/0 feet	11,623 8 0
	13,330 1 0
Adjusting slope, contingencies, &c. @ 5 $\frac{1}{2}$ feet	666 8 0

13,976 9 0

(Signed) T. PRINSEP, Lt. Engr.
Superintendent of Canals.

CALCUTTA,
CANAL'S SUPERINTENDENT OFFICE,
19th March, 1827.

* Nothing appears to have been done with reference to the purchase of the ground referred to in this Estimate.—J. M.

No. 72 $\frac{1}{4}$.

To LIEUT. T. PRINSEP,
Superintendent of Canals.

SIR,

Dated 27th March, 1827.

I am directed by the Canal Committee to acknowledge the receipt of your Letter No. 33, of date the 19th March instant, with its enclosures.

Before submitting to Government the proposition contained in the 9th paragraph of it, the Committee would wish to be informed whether the same want of tenacity in the soil of the Banks of the Canal exists the whole way from the Cooleah Bridge east to Baleah Ghaut, for should such prove to be the case, it will be perfectly useless constructing the Puckah Road, Drains and Tunnels of Exit for the distance proposed by you, because the Canal below the Bridge must, as a consequence, gradually fill up, rendering it impassable for boats to reach that part of it where the depth would be preserved by the adoption of the plans proposed by you.

I am therefore directed to request you will favour the Committee with the information required, as relates to both the North and South Banks of the Canal generally.

CANAL COMMITTEE'S OFFICE,
CALCUTTA :
27th March, 1827.

I have, &c.
(Signed) J. N. JACKSON,
Secretary Canal Committee.

No. 72 $\frac{1}{2}$.

No. 94.

To H. T. PRINSEP, ESQ.
Acting Secretary to Government.

SIR,

With reference to the annexed extract of a Letter from Lieutenant T. Prinsep, Superintendent of Canals, dated the 19th March, and to the statement which accompanies it, showing the encroachments that have been made upon Land, the property of Government, situated along the bank of the Entally and Balliaghat Canal: I am directed by the Canal Committee to request, that they may be informed in what way they should proceed to effect the recovery of the Land described by Lieutenant Prinsep, which amounts, as per his statement, to 18 Cottahs, 12 $\frac{3}{4}$ Chittacks.

CANAL COMMITTEE'S OFFICE,
CALCUTTA :
11th May, 1827.

I have, &c.
(Signed) J. N. JACKSON,
Secretary Canal Committee.

NOTE.—There is no trace of any reply having been made by the Government to the above Letter, or what was done to recover possession of the 18 Cottahs, 12 $\frac{3}{4}$ Chittacks of Land.—J. M.

No. 73.

No. 41.

To MAJOR J. N. JACKSON, A. Q. M. G.,

Secretary to the Canal Committee.

SIR,

4th April, 1827.

In reply to your Letter No. 60, of 27th ultimo, I have the honour to state upon the several points therein alluded to—

That in the first place, the Ooltahdanga Canal, agreeable to Major Schaleh's Scheme, will furnish a current of water during the nine dry months of the year, which will be sufficient to keep its own bed, and that of the part of the old Canal eastward from its junction, clean from any sediment that would be created by the defects which I have proposed to remedy in the part westward of the junction, in which the water will still remain stagnant,—and that in the second place, as the length of Road from the junction eastward is $1\frac{1}{2}$ mile, with a Road on each bank, I have considered the expense of laying the whole with bricks too great to propose to the Committee, merely on the score of improving the thoroughfare.

The badness of the soil is general; but much the worst along the North bank, from the lime and rubbish which is left on its surface in the constant landing of the trade of the Nullah—along the South bank, there is already some vegetation upon the slope, which may be increased when its steepness is reduced, and the surface of the road properly drained, to prevent the washings from it falling over [the] slope into the Canal. This vegetation is the consequence of there being little or no landing of goods on the South bank.

The Carting of goods along the roads eastward of the disembogement of the Ooltahdanga Canal, must, as I have stated in the Report, considerably decrease on the opening of that Canal, and I am inclined to the opinion that, notwithstanding the badness of the soil, the Kutcha Roads, with proper care in Draining them, will be found sufficient for the diminished thoroughfare which may be anticipated.

The Committee will understand by a reference to my first Report* upon the subject of this Canal, that while the water westward of the Koolya Bridge is stagnant, there will still remain two causes of constant deposit, namely, the constant washings and filth brought by the Town-drains through the Durumtollah Main Exit, and the occasional flow of turbid water from Tolley's Nullah during the rainy season. The last of these may be rendered by a draw-hatch to the principal Drain in the neighbourhood of the Bhowanipoor Road. The first however does not admit of so easy and immediate a remedy. A periodical expense in clearing out this part of the Canal is therefore unavoidable, although by the means proposed, it will be considerably lessened.

I have, &c.

CALCUTTA,

(Signed)

THOS. PRINSEP, Lt. Engrs.,

CANAL SUPERINTENDENT'S OFFICE:

Superintendent of Canals.

4th April, 1827.

* Dated 20th November, 1826.

No. 74.

No. 91.

To LIEUT. THOS. PRINSEP,

Superintendent of Canals.

SIR,

In reply to your explanatory Letter, of date the 4th ultimo, on the subject of the measures proposed by you in a Letter dated the 19th March last, for improving the Entally Canal, I am desired by the Canal Committee to inform you, that previously to their sanctioning the commencement of the Puckah Road, Drain, and Tunnels of Exit on its Northern Bank, and the Excavation connected therewith, between the disembogue-ment of the Ooltahdanga Canal and the Durrumtollah Main Exit, they are desirous of witnessing the completion of that part of the Ooltahdanga Canal situated between Chitpore and the existing Canal, through which you anticipate that a sufficient current of water will flow during the nine dry months of the year to keep its own bed clear from sediment, as well as that part of the Entally Canal eastward from the junction towards the Salt Water Lake.

The statement of encroachments made by individuals upon the Company's ground on the bank of the Canal, which accompanied your Letter of the 19th March, falls very far short of what has been anticipated. Measures will, however, be immediately adopted for obtaining re-possession of the 18 Cottahs, 12 $\frac{2}{3}$ Chittacks of Land described in the statement above alluded to.

With regard to the additional ground that is required on the South bank of the Canal to the eastward of the Cooleah Bridge, between the Points A B and C D, (Vide survey), amounting to 9 Cottahs, 13 $\frac{1}{2}$ Chittacks, I am directed by the Committee to state, that provided possession of the above ground could be obtained on reasonable terms, they would propose to Government the expediency of its being purchased and thrown into the General line of Roadway, averaging 24 feet in breadth; you will therefore be pleased to ascertain* the rate at which the ground could be obtained, and communicate the same to the Committee at your earliest convenience.

CANAL COMMITTEE'S OFFICE,
CALCUTTA:
7th May, 1827.

I have &c.
(Signed) J. N. JACKSON,
Secretary Canal Committee.

* NOTE.—There is no trace that Lieutenant Prinsep ascertained the rate at which the ground could be obtained, or that the Committee addressed the Government upon the subject.—J. M.

No. 81.

No. 66

To MAJOR J. N. JACKSON,

*Assistant Quarter-Master General,**Secretary to the Canal Committee.*

SIR,

I have now the honour to forward the Accounts and Papers for June, which, with a few trifling exceptions as per margin,* to form additional Bills during the month of July, will close the expenses of the season, as sanctioned on my Estimates of 16th October 1826, amounting to Rs. 42,707:8:0.

2. As the several works may be considered perfectly distinct, after a few general remarks I will proceed to detail the result of my operations upon each consecutively. I forward accompanying, a General Abstract of the Expenditure of the season, and four different Plates as per margin, for reference, to illustrate the observations that I may have occasion to offer.

3. The operations of the year will, I trust, be deemed on the whole satisfactory, in as far as they extend. They have necessarily been limited, and comprise many points, the ultimate success of which, remains still to be developed, as depending upon future circumstances.

4. The new navigable communication, between the Lake and the Eshamuttee at Hosynabad, is not completed by the present year's proceedings, and may perhaps require even beyond another season to perfect. This portion of the undertaking, to which I have considered it advisable at first to confine my operations, is that upon which the chief expense was anticipated in the original scheme: it comprises the most difficult part, indeed the only part of which the feasibility was at all doubtful; and when finished, will replace that portion of the old route towards Calcutta always, and hitherto considered, the most replete with danger and inconvenience.

Old Scheme.

* Hosynabad to Choumooha.	11 Miles.
Chultabarya.	3½
Ditto, to Bhaminghatta.	7
	<hr/> 21½ Miles.

Present Scheme.

* Hosynabad and Baley- gunge.	3 Miles.
Bhowanipore.	2
Hinchee Khal to Baimoree.	1½
Chultabarya.	2½
Bhaminghatta.	5
	<hr/> 14½ Miles.

5. The estimated length required for actual excavation in this part was 21½ miles: The surveyed line adopted, reduces it to little more than 14½—which, with the various subsidiary expenses of Tracking-paths, deepening old Nullahs, and damming up others, will reduce the expense to little upwards of 1,50,000 in place of 2,10,000, as originally sanctioned; a saving which will allow funds to do much more for the perfection of the part of the navigation, than could have been originally expected.

6. The scheme, which I have proposed for the operations of the approaching season, has for [its] object, to open the communication along this line, and render it fit for a part of the Craft, if it is not possible to render it adequate during the season, to all the purposes of the eastern trade.

7. The operations in Dredging the Channel through the Lake, and deepening the Canal in immediate connection with Calcutta, have been attended with a success that promises every probability, with the aid of another Dredging Boat, as recommended in the following remarks, of placing that Channel on a most respectable footing in the course of twelve months, and considerably improving the facilities of navigable approach to Calcutta. I cannot refrain here from calling the attention of the Committee to the increased difficulties that

* A Bill for Balya-
ghat 248:11:3
„ Chultabarya
101:6:10.

Plates No. 1, A,
Dredging machine.
„ 2, B. Chultabarya.
„ 3, C. Bhowanipore.
„ 4, D. Bhaminghatta.

seem yearly, to press more injuriously upon the trade that is brought to Calcutta by the Soondurbun route. Although piracy is now no longer dreaded, the frequency of wrecks appears rather to increase than diminish. The passage through Tolley's Nullah appears also yearly to increase in difficulty. It is now impracticable for laden Craft of any size, except during the spring tides; and as, when the removal of all the old confined bridges has had full effect, the rise and fall of tide in that Nullah will probably increase, (the passage becoming necessarily more effected by the variations of the tides in the Hooghly River), it may be expected to become even more limited in its facilities of navigation.

8. The necessity of providing a Canal of Communication between the River and Soondurbun Navigation, upon different principles from the present one, appears therefore to be daily more urgent; and I trust the Committee will not consider me importunate, when I express my earnest hope, that the purchases of ground which are conducting under their immediate superintendence, may be brought to a conclusion at an early period; to allow of my commencing the execution of this part of the undertaking, from which so much immediate advantage is likely to result. The present state of these purchases not allowing me to anticipate the possibility of commencing next year upon the Circular Canal of Communication. I have hitherto withheld the plans and estimates for its detail, which I had been preparing to submit—I shall however, be ready to forward them for the inspection of the Committee, whenever any prospect is offered of bringing the purchases to a close.

9. The Committee will observe, that the different works have generally fallen within the rates of their Estimates. The average inclusive rate per Chowka of the Chaltabarya excavation falls considerably below that of the Hoseinabad and Bayley Gunj excavation of 1823, and although it is beyond Major Schalch's original Estimate, which was assumed upon the old rate of Tank-Dredging [? Digging] in Calcutta of 1800 to 1810; Major Schalch's general rate of 10,000 Rupees per mile, will still be found correct as an average.

10. I have found myself necessitated to entertain an establishment for the conduct of the Chaltabarya and Mufussil operations of the season, beyond that authorized as the permanent establishment of the office; the expense of which I have hitherto charged to the work. As however, this cannot be done during the rainy months, when no works of this kind are proceeding, and it is highly unadvisable to discharge the head and responsible sirkar, to whom I necessarily look for the recovery of all outstanding balances that have occurred under his management, I have to request the sanction of the Committee to the continuance of his salary of 50 Rupees per mensem, and that of his under-sirkar of 16 Rupees; till it can again be charged to the works.

11. The Committee must be aware, that I have hitherto conducted the business without any European assistance except that of Overseer West, for three months, whom I was obliged to discharge on account of ill health; and Private Turner, whose services have only been useful as a Surveyor and Draughtsman.

12. As the work proceeds, and objects that require supervision multiply, the Committee can scarcely expect that I should be able to proceed in the same manner. I have therefore to hope, that I may be allowed to select some intelligent European to be permanently attached to the Department, who may be continually useful as a practical Mechanic and general Overseer. In case the Committee deem it advisable to construct more Dredging machinery, or allow me as suggested to construct any economical machinery for draining off the water that always interrupts the excavation of the Mufussil Canals, the services of such an Overseer will be immediately required, and I shall not fail diligently to search for some person of the description best qualified to answer the purpose. In the meantime I have to hope, that I may be allowed to bring on the strength of my Establishment, an Apprentice (F. Mullins), whom I have entertained since January at my own

expense, at 30 Rupees per month, to be charged to the Dredging operations, to which he has been attached from the first ; his salary to commence from the 1st July.

13. Any further European Assistants, covenanted or uncovenanted Officers, as it must depend upon the extent of operations, which it may be thought advisable for me to undertake at the same time—it will be quite unnecessary for me to consider in this place, and I rest confident in the judgment of the Committee, to suggest to Government, any thing upon this subject that they may hereafter see occasion for. I have only to remark, that while the operations are limited to the Scheme in the accompanying proposition, I feel myself perfectly capable, while enjoying health, to carry them on without any Covenanted Assistant. If however, circumstances put it in the power of the Committee to order a commencement of operations upon the Circular Canal in the present year, I fear my own unassisted exertions will scarce suffice to superintend the whole operations in that satisfactory manner, which could be wished for [in] such an extensive undertaking.

The following pages contain my observations upon the works of the season.

	I have, &c.
CALCUTTA :	(Signed) THOS. PRINSEP, <i>Jt. Engrs.</i>
CANAL SUPERINTENDENT'S OFFICE,	<i>Supt. of Canals.</i>
28th August, 1827.	

(A true Copy.)

J. N. JACKSON,
Secretary Canal Committee.

No. 81. a.

Balliaghat or Eastern Canal.

1. The total expenses on this head, have exceeded the estimate of Rs. 4,903 : 8 by the trifling sum of Rs. 78 : 14 : 3 as per abstract, chiefly on account of great excess of work executed in the principal item of excavation.

* No. 36, of 19th
March, 1827.

2. I have been unable to execute the whole estimated work upon the slope of the banks on account of the narrowness of the Road, as stated in my Report,* and to the West of the Koolya Bridge I have thought it advisable not to do any thing immediately to the slope, until the Committee are enabled to authorize something more effectual for the improvement of the Road along its bank ; meantime, I have incurred an expense of Rs. 385 : 2 in sloping and draining the Road East of the bridge, to prevent dilapidation and improve the thoroughfare.

3. The nature of the season has occasioned this latter work to proceed but slowly, and I have lately stopped it altogether, until the rain should cease.

4. If the Committee approve of the measure, I will expend whatever further sum may be authorized, for placing these two Cutcha Roads in a proper state of repair. The thoroughfare is very great along them, and their present state far from efficient.

No. 81. *b.**Dredging Machinery and Operations in the Salt Lake.*

1. The Dredging Machine constructed upon Native Boats, by order of the Committee, from the materials found in store, of which I have the honour to forward a drawing, was completed and commenced excavating in the mouth of the Eastern Canal on the 15th July. Its expense has scarce exceeded the Estimate, although many circumstances have contributed to swell that amount.

2. The Machine most perfectly answers my expectations, and is capable of excavating upwards of 2,000 Mds. of soil during the day with perfect ease [to] itself, and with 18 men working at the handles. At present, while I have only two Receiving Boats, of 300 to 400 Mds. burthen each, its daily work amounts to four Boat-loads, or upwards of 1,200 Mds., to accomplish which, the machinery is in actual motion very little more than four hours.

3. The two Nuddya Dredging Boats were likewise repaired, caulked, and tinned early in July, and they first commenced excavating in the Lake Canal a few days after the 11th July.

4. The passage of the second from Kidderpore was somewhat delayed, and as some time was spent in caulking and repairing the five Receiving Boats, which arrived from Mr. May on the 13th July, and were found on their arrival to be leaky, and in other respects very defective, the second Nuddya Boat was enabled to work very few days in July; during the month of July the number of Boat-loads excavated and carried away amounted to fifty-six, or equivalent to 16,800 Mds. of soil.

5. The three Boats are now in full work, excavating at the rate of 3,800 to 4,000 Mds. per diem, viz.

	Crew.	Coolies.	Boat Loaders.	Mds.	Hours of work.
Canal Committee's Boat,	18	30	4	1,400	5
No. 1, Nuddya, Messrs. Jessop,	18	36	4	1,200	5
No. 2, J. Kyd, Esqr.,	18	50	4	1,200	7

6. The flat European Receiving Boats, attached to the Nuddya Dredging Boat, are capable of holding more than the quantity now filled upon them, but their shape, and the shallowness of the place in which they work, will not allow it. By adding to the number of Mud Boats, the quantity excavated by all three Dredgers, might be increased nearly two-fold; and I am now preparing two additional Native Boats, purchased under the order of the Committee, which will raise the quantity of the Canal Committee's Boat to upwards of 2,000 Mds. per day, without requiring any addition to the number of Coolies employed: whereas, to allow the Nuddya Boats to do any quantity beyond what they do at present, it would be necessary to increase the number of Coolies to 50 or 60 from the present number 40, to allow of a relief. It is now quite evident, that the method of working the machinery by winches adopted in the Committee's Boat, is by far the most economical in its effect, and with very few additions, which will be furnished gradually during the progress of the work. The Canal Committee's machinery, but for the disadvantage of resting upon Native Craft, is capable of being rendered far superior to either of the other two Boats, as they are constituted at present both in its effect and economy.

7. The machinery at present resting upon Native Craft as in the drawing, is so managed, that in case of any injury to either of the Boats, the weight may be taken off from the injured one and another Boat substituted without dismantling the machinery. I have with this intent attached a spare Boat to remain ready, as all such Craft are subject to accident in shallow water.

8. It will, I expect, be found necessary to shift the machinery at least twice during the year, as Native Boats cannot be expected to remain longer in salt water without caulking.

9. If however, the Committee, now that the perfect success of the apparatus is established, are desirous of giving it the superior advantage of resting upon substantial European Boats, I will make search for some Craft that may be fit for the purpose, or estimate the cost of building such in the most economical manner.

10. Judging from the work executed by the present Dredging Machines, I can scarce expect to complete the entire excavation of the Canal through the Lake in two seasons with the present means; even although I should have the assistance of Mr. May's machinery for four months every year. I am therefore induced to suggest the propriety of constructing a second Dredging Boat, upon nearly the same construction as the Committee's Dredging Boat, the expense of which, judging from the price of articles found in store,

* Expended on this Estimate of Rs. 40,000,

By Major Schalch in 1823-24.

Deepening East Canal,	4,436	12	0
Embankment in Lake, ..	1,451	7	6

By Lieutenant Prinsep in 1827.

Deepening East Canal, ..	5,082	6	3
Dredging apparatus, ..	4,494	1	3
Cost of stores for above, as per Jessop's bill,	3,307	3	7
Mr. May's bill for dispatch,	302	8	3

Total,	19,074	6	10
Add expenses attending Mr. May's Boat till November next,	2,000	0	0
Working Committee's Boat for 12 months, ..	4,000	0	0
Total,	25,074	6	10
Remains of Estimate, ..	14,925	9	2

as per Messrs. Jessop's bill, and the expense incurred by myself, would not exceed Rs. 8,000, and the machinery would prove most essentially useful, if not absolutely necessary in other parts of the undertaking; even when the Channel through the Lake is completed.

11. There will still remain, as per marginal account, in January next, a sum of 15,000 Rs. of Major Schalch's original Estimate* of Rs. 40,000, for Lake and Eastern Canal, besides the value of the machinery—it would therefore appear highly advisable to expedite the completion of this part of the undertaking by an outlay in constructing more machinery of this kind, which will, in all likelihood, prove so useful afterwards to other parts of this extensive undertaking.

No. 81. c.

Chaltabarya Canal.

1. The operations under this head have not been attended with such perfect success as could have been wished. The Canal however, I trust, with very little more expense and in no very long time, will become perfectly fit for all the purposes of Navigation.

2. A strata of oozing sand, of the nature of which I have no doubt the Committee are perfectly well informed, has baffled all my endeavours to excavate beyond the depths stated in the longitudinal section inserted in the Sketch No. 2 or B.

3. The expenses incurred on this Canal have amounted to Rs. 17,564 : 8 : 4½, as per general abstract, for excavating 10,045¹²/₁₆ Chowkas, of 729 cubic feet each, in 12,930 running feet; or upwards of 2 miles, and Rs. 1,665 : 4 : 6½ for deepening, widening, and clearing 3,500 running feet of the bed of the old Nullah, which has been converted into part of the Canal. The inclusive rate† of excavation per Chowka is thus reduced to

† Average rate of excavation,	Rs.	As.	Ps.
Average rate, including Contingencies.	1	8	5
	1	12	0

much less than that incurred upon the Hoseinabad Canal in 1823, and if the Canal could have been excavated to the full depth, this rate would have

been reduced still lower, and I can now confidently assure the Committee, that the average rate of 10,000 Rs. per mile assumed by Major Schalch for excavation out of the precincts of Calcutta, will not be exceeded.

4. The balances* left outstanding, (chiefly the consequence of the difficulty created by the occurrence of this stratum of oozing sand) amount as per list accompanying, to

* Outstanding balances as
per Statement No. 7,
amount to .. Rs. 1,392 : 4 : 6½

what the Committee will acknowledge to bear a very trifling proportion to the outlay for a work of this nature executed on contract.

5. The present section of the Canal will afford at high water during the neap tides, a depth of no where less than five feet, in general from 7 to 8—with the exception of one spot near its western mouth, where the sand rose higher than elsewhere, and as the current which I have introduced into the Canal is likely quickly to excavate the bed still deeper, it may confidently be expected, that there will be upwards of 7 feet of water every flood-tide in the Canal after the present rains.

6. The oozing sand in question is in nature a perfect fluid, and therefore easily moved—its thickness I ascertained, by boring, to be from 5 to 9 feet in different places. It is evidently a tide deposit, and I should think of a very slack tide. I am therefore induced to place great confidence in the method I have adopted for clearing out this sand to a greater depth, and as the same principle if successful, may be applied in other cases, I will here explain its chief outlines for the information of the Committee. Its action will be gradual but economical, and I trust tolerably certain, if carefully watched, and every requisite attention is paid to clear away the banks and bed of the two ends, that no obstacle may occur to the free passage of the tide.

7. The principle in question consists in providing to the Canal which it is required to scour or deepen, a reservoir or basin, in which the flowing tide may spread; the discharge in quantity, from which, through the Canal, (on account of the great body of water having comparatively little effect in lowering the surface of such reservoir,) will create a slope in the Canal tide during the ebb: productive of a much greater velocity of current than could be occasioned by an ordinary tide in such a section.

8. The velocity of current required to move sand, according to the Chevalier Du-Buat's experiments, was† 8 to 10 inches per second at the bottom, which reduced to the surface, would require a correspondent velocity of 14 to 16 inches per second, or about three-quarters of a mile per hour.

9. In the case of the Chaltabarya Canal, I have applied as a receptacle for the tide, the old bed of the Nullah that formerly connected Ooryaparah with Tarda, which has nearly choked from having been bunded across for perhaps the last 40 years.

10. It appears to have been once a Nullah of considerable dimensions and importance, its present width at high-water, neap tides, averages upwards of 300 feet, and depth about 7. To allow a greater effect, and secure a greater body of water, I have cleared away the several mud bunds that crossed its bed in several places, between the west mouth of the Canal and Ooryaparah, and have constructed a solid bund‡ below the junction of the new Canal, to prevent any possible access of tide from Tarda.

‡ At C. in Plate B.

11. It is not difficult to demonstrate, that the fall of water through the Canal of 3 miles in length, would for 4 hours of the ebb reach, if not exceed, 3 feet in all, or 1 foot per mile. Now, in this case, if the section were only 420§ square feet, the velocity agree-

§ Breadth 70 × 6 depth... = 420
|| DeHaviland. Tables A and
B, pages 77 and 82.
Enter with Hyd. mean rad. or $r = 60$ in.
Slope or $\frac{1}{2} = \frac{1}{5280}$

able to DuBuat's Tables,|| would be 32 inches per second, or $\frac{18}{10}$ miles per hour: which is more than that required. It cannot be said that the flood-tide would bring back as much as the ebb would carry down, in-

asmuch as it would require a greater force to carry the sand up an inclined plane, which must take place in its return to the Canal.

12. There is therefore every reason to suppose, that the Chaltabarya Canal may be thus rendered in every way sufficient without much further expense, and in no very long time.

No. 81. d.

Bayleygunge Canal and Dam across the Kullooar Khal.

1. Of the 10,000 Rupees inserted in my Estimate for these two works in connection, I have thought it advisable to incur an expense of only Rs. 2,792 : 6 : 4½.

2. I have perfectly cleared the unfinished bed of the Baley Gunj Canal,* of which

* At an Expense of Rs .. 2,052 14 9 I found many parts obstructed by roots and stumps of trees, and many places not excavated at all in 1823, which served as divisions between the different lots given to the contractors. I have also excavated the shallow parts of the bed, so as to complete the depth of water where shallowest, to 5 feet at high-water, neap tide. Before quitting the spot, I took the precaution of destroying the bunds at both ends, and the Channel is now perfectly clear for the introduction of any current.

3. Upon the second work I have expended only Rs. 739 : 7 : 7, in preparing ground for excavating sufficient earth to form the dam. I have also renewed a former contract for Soondree spars with Luckun Sutra, against whose name there is a debit of 600 Rs. in the former list of outstanding balances. This individual had already collected a quantity to the value of two-thirds of his advance, when the operations of 1823 were closed; and is now willing to make good the debt, by collecting the whole before October next, when the work must begin.

4. In my former Report, I alluded to several points which required investigation, before the execution of this work. I beg leave now to offer the result of many observations made during the season.

5. It appears, that from January to June, the arrival of the flood tide at the East end of the Hoseinabad Canal, takes place at the least one hour before the arrival of the tide in the Eeshamuttee, within 250 feet of the same spot, and that, while rising, it preserves a command in actual level of generally more than one foot, which superiority it maintains at extreme flood.

6. The commencement of the ebb is simultaneous. I frequently found, however, that while the fresh water tide had fallen only 3 feet, the Salt water tide had fallen 7½ inches, and that the extreme low water of the Salt tide was one foot lower than the fresh, or more.

7. These circumstances accord with my former anticipations, and I therefore now consider the dam necessary, both to secure the neighbourhood from the great influx of Salt water, that might otherwise put them to considerable inconvenience, and as a means to excavate the Bayleygunge Canal, and procure an uniformity of current through its bed.

8. I have therefore included this work in the Scheme and Estimates for the ensuing season, and shall proceed to make instant preparation, so as to commence in October.

No. 81. e.

Clearing and Bunding for the Bhowanypore Canal.

1. The operations under this head have created an expense of 3,231 Rs. 9 As. 7 P. in place of 7,500, as per Estimate. The distance cleared is about 2 miles, which reduces the rate to nearly 1,500 Rs. per mile, as per Estimate, after making allowance for the expense of clearing the bank of the Gobra Khal, and constructing a walking bund for the passage of the Coolies to Bayleygunge.

2. The Plate No. 3 or C. will show, that I have altered the line of 5 miles, marked out in the Plan* forwarded by Major Schaleh in 1824 for this Canal, and that I have still left untouched the remaining division† X to Y, from the mouth of the Hinshee Khal to the mouth of the Bairmaree.

3. A distance of 2,000 feet has been gained in the cut across to Hinshee Khal, by commencing the Canal higher up the Gobra Khal, which here runs East and West. The straight line A, F, was first laid out and cleared for the purpose; the nature of the ground has however, rendered a deviation from the straight course necessary, and the line I have now ascertained to be most judicious is denoted by A, B, C, D, E, F.

4. The configuration of the ground, as well as the soundings I have made into its understrata, seem to give every indication of the course of some large River, or what is equally probable, as the general bearing of this tract of sand is nearly parallel to that crossed at Bayleygunge, that the tracts in question were at some very remote period, similar to the present spits of sand which are found at the mouth of the Hooglee. The line A, F, crosses two ridges of sand, B, C, and D, E, between which runs a low marshy tract, terminating in mangrove jungle South.

5. On the two ridges in question, the sand (with ooze and water) is found at 5 to 7 feet below the surface, which is at least 3 feet above high tide—so that it would be difficult to excavate more than 3 or 4 feet below H. W. neap tide. By taking advantage of the bed of a small Creek which appears to have crossed the sand, I have traced a line, throughout which, by actual sounding, I find I shall be able to excavate to the depth of 8 to 10 feet below H. W. The length of the curve line will add only 500 feet beyond the straight distance.

6. I have thought it advisable to await the success of the Bhowanepore Canal, before incurring any expense upon the remaining division X, Y. The communication between the Gobra and Bairmaree and Chowmoo Khals will still be open by way of the Akra-tulla Nullah, which, although a little more circuitous, is sufficient in its dimensions

* See page 16, of this Appendix—J. M.

† Now recommended by Capt. A. H. E. Boileau, and Mr. Healy to be executed. See Appendix (J) page 5, and page 140, to Municipal Committee's 2nd Report.—J. M.

No. 81. f.

*Proposed scheme for the operations of the approaching year 1827-28.**Estimate and Plates No. 3 and 4, or C. and D.*

1. The several objects which I propose to pursue during the approaching season, are as follows:—

2. *First*, the construction of the *Dam across the Kulloor Nullah*, and *opening of Hoseinabad Canal* towards the Eshamuttee River: every preparation has been made to commence this work in October if it is approved by the Committee. The method of constructing a Dam of such large dimensions, is well known to the Natives of the district. A double row of large piles (Soondree) is driven across the Channel, the roots of which are well fortified with mats, fascines, and branches of trees, to prevent the earth thrown

between the double row of piles from being carried away by the flux and reflux of the tide. As a still further precaution I intend to sink across the Channel four or six condemned Native Boats, of the largest burthen, filled with earth and any heavy substance procurable on the spot—which will act as an additional support to the piling.

Secondly.—The excavation of the *Bhowaneepoor Canal*—10,000 feet in length. Upon this work, it will be necessary to proceed with considerable caution, to prevent its being left not excavated to the full depth, as happened to the *Bayleygunge Canal* in 1823. In order to prevent the recurrence of such an evil, (although I shall make every effort to complete the whole) if any unforeseen difficulty or great sickness should disappoint me in the number of labourers I may be able to procure, I shall take the precaution to assign them a quantity of work proportioned to what they can finish without difficulty.

Thirdly.—*The Canal traced out in Sketch No. 4. D. between Chultabarya and Baminghatta*, being in length 5 miles; and *some little expense necessary to complete the Chultabarya Canal*. The latter 2 miles of this new line are through a tract of low, jheely, mangrove jungle, which it may be necessary to prepare previous to excavation. I insert the whole 5 miles in the Estimate for the year, and shall make every effort to complete the whole. In case however this is not in my power, I shall be able at all events to open the communication with Baminghatta by finishing to D, on the Bearta Khal.

Fourthly.—*The conduct of the Dredging operations, and the construction of any new Dredging machinery* that may be ordered by the Committee to assist and expedite the scouring of the Lake Channel—which cannot otherwise be completed in another season.

The fifth object will be *the contrivance of some economical machinery for the facilitating the means of emptying the great quantity of water* which is found in excavating such Canals as the *Bhowaneepoor*, *Bayley Gunj*, or indeed any place which has previously been subject to daily inundation.

The present method of raising this water by basketing, is expensive, harrassing, and very ineffective; the work would therefore be greatly facilitated if any more perfect method were at my disposal.

I cannot immediately propose any specific plan upon this subject, as I wish it to be economical, and that the expense upon it may be covered by the rate of excavating per mile—I shall therefore make every search for pumps, or other engines, which may be procurable in Calcutta, and report to the Committee my having obtained any thing fit, and upon the method of applying them to the object in view.

The quantity of Canal to be excavated during the season, would, I imagine, warrant the expenditure of 2 or 3,000 Rs. on this head—which would not be thrown away, inasmuch as the pumps would still be serviceable.

Lastly.—I have the honour further to remark here, upon the difficulty experienced to the work for want of some convenient place for store-room and work-shops, upon the Eastern Canal. I have been hitherto obliged to hire a small Hut, the rent of which has been charged in my monthly Bills, for the expenses of the Eastern Canal.—Smiths' and Carpenters' work has, by the indulgence of Captain Baker, been conducted in the Allypoor Yard, where, at present, all the tools and materials, except fowrahs and axes, still remain. At present, while the work is proceeding in the Lake, the distance to Allypoor is found exceedingly inconvenient—and as the wear and tear of the Dredging Boats generally requires a forge constantly at work, it will be necessary to have some convenient place in their neighbourhood—and I have therefore to request the sanction of the Committee to my hiring such, until their proceedings in purchasing ground, place at my disposal a spot and building adapted to the purpose.

No. 81. *f.*⁽¹⁾*Estimate to accompany the proposed Scheme for operations during 1827-28.*

1st Item,—Dam across Kullooar River, &c., being the residue of			
Item in expense of last year,...	...	...	7,207 9 7½
2nd Ditto,—Bhowaneepoor Canal, 2 miles, @ 10,000 Rs. per mile,			20,000 0 0
3rd Ditto,—Baminghatta Canal, 5 miles, @ 10,000, Rs. ditto, ...			50,000 0 0
Add expenses required upon Chultabarya Canal and old			
Nullah, ...	...	...	3,000 0 0
4th Ditto,—Dredging operations, Estimate for 12 months, ...	4,000		
Probable expenses attending Mr. May's machinery which will			
have to be debited to Canal Department up to October, ..	3,000		
Construction of a new Dredger,	8,000		
Working the same for 8 months,	2,400		
			———— 17,400 0 0
5th Ditto,—Construction of any Hydraulic Engines to assist excava-			
tions, part of which will be hereafter deducted, by			
gain in rate per miles of excavation,			3,000 0 0
	Total Sicca Rupees,		1,00,607 9 7½

CANAL SUPERINTENDENT'S OFFICE :

28th August, 1827.

(Signed) THOMAS PRINSEP, *Lieut. Engrs.*

(True Copies,)

J. N. JACKSON,

Secretary Canal Committee.

(No. 82. and No. 83. omitted.)

No. 84.

Extract of a Letter dated 10th September 1827, from the Secretary to the Canal Committee to H. T. PRINSEP, ESQ., transmitting with Observations the Paper marked No. 81. and its inclosures.

[SOONDURBUN CANALS.]

“The great reduction which that Officer has been able to effect in the length originally deemed necessary for this portion of the Scheme, must be deemed highly satisfactory ; both as regards the diminished length of the space to be excavated and the great saving in expense that will consequently follow.

“The line according to the original survey measured 21½ miles, to complete which, the sum of Rs. 2,10,000 had been assigned. By a recent and more accurate examination of the Country, however, Lieutenant Prinsep has ascertained that the length will not exceed 14½ miles ; which he calculates may be completed for about Rs. 1,50,000, leaving Rs. 60,000 to be appropriated as may hereafter appear necessary.

“6th. Lieutenant Prinsep purposes during the season to open the communication along the whole of this line, thereby rendering it fit for the purposes of the Eastern Trade.”

Works.	Sums Estimated.	Sums Expended.
Constructing a Dredging Machine,	4,304 0 0	4,494 1 3
Working a ditto ditto,	1,000 0 0	.. ... ..
Excavations Chaltabarya Canal, 15,000, including an after grant, say 5,000,	20,000 0 0	19,229 12 11
Clearing and bunding from Bayleygunj to Chou- mooh,	7,500 0 0	3,231 9 7 $\frac{3}{4}$
Hoseinabad Cuts and Kullour Dam, 10,000, excluding amount carried to Chal- tabarya Canal as above, 5,000, ..	5,000 0 0	2,792 6 4
Deepening, &c. &c., Balleaghaut Canal,	4,903 $\frac{1}{2}$ 0 0	4,982 6 3

(No. 85. omitted.)

No. 86.

To MAJOR JACKSON,

Secretary to the Canal Committee,

27th September, 1827.

SIR,

I am directed by the Right Honourable the Vice-President in Council to acknowledge the receipt of a Letter from you, dated the 10th instant, together with the detailed Report and Maps submitted by the Superintendent of Canals in explanation of the result of his operations in the past season, and on the works proposed for the ensuing year.

2. His Lordship in Council sees every reason to be satisfied with the progress made by the Superintendent of Canals in the past season 1826-27, and has accordingly passed the undermentioned Bills submitted by him for expenses incurred in the various works subject to his superintendence in the month of June last, viz.—

Bill No. 32 for Expense of Balya Ghaut Canal,	Rs.	480	11	5 $\frac{1}{2}$
„ „ 33 „ Expense of a Dredging Machinery,	752	4	10	
„ „ 34 „ Expense of Chultabaria Canal,	6,000	5	6 $\frac{1}{2}$	
„ „ 35 „ Expense of Bayleygunge Canal,	151	11	10 $\frac{1}{2}$	
„ „ 36 „ Expense of Bhowaneepoor Canal,	70	0	0	
„ „ 37 „ Expense of Kullooar Nullah,	21	0	0	

3. The several Abstract Statements (Nos. 1 to 5) of estimated and actual expense of the works mentioned in the 2nd paragraph of your Letter having been found correct, are, as recommended by the Committee, passed by Government.

4. The success of the Dredging apparatus is considered very satisfactory, and warrants the recommendation that a similar apparatus, capable of being fitted on to Native Boats or on others, if procurable, should be prepared, His Lordship in Council therefore sanctions the disbursement of 8,000 Rupees for this object.

5. The proposed works for the ensuing season, besides prosecuting the Dredging, which, including the New Boat, is estimated to cost 17,400, are as follows—

6. i, The Dam of the Kullooar estimated cost 7,207.—2nd, The Bhowaneepore Canal 2 miles, 20,000 Rs.—3rd, The Bahmunghatta Canal, from Cheltabareea to the Salt Water Lake Outlet, 5 miles, 50,000 : but this last mentioned work the Superintendent doubts being able to complete for the whole distance, in which case the line will be carried to a Channel somewhat more than half the distance, so as to leave the navigation open, as the result of the works of the season. To this object, His Lordship in Council concurs with the Canal Committee in attaching very great importance. He accordingly sanctions the works above described being undertaken at as early a date as possible. His Lordship in Council further sanctions the expenditure of 3,000 in improving the Cheltabareea Canal and old Nullah, and 3,000 for the construction of Hydraulic Machinery to keep works clear of water. This latter charge, as it will diminish the cost of excavation, will produce a corresponding saving in the rate estimated per mile as above stated. The total estimate for the year, not reckoning this saving, will be 1,00,607, for this part of the new line of Canal.

7. His Lordship in Council cannot refrain from noticing favourably the ingenuity and science displayed in the application of the principle for producing a current to deepen the Channel of the Canal, when the bed reaches the oozing sand. This is conspicuous in the management of the Cheltabareea Canal, and His Lordship in Council hopes that similar means will be found of overcoming this grand obstacle in the lines remaining to be excavated.

8. The observations of the Superintendent and of the Committee, in regard to the state of Tolly's Nullah, and the increasing difficulties of that passage, have struck His Lordship in Council forcibly, and, combined with the prospect that the rest of the new line will be completed this season, point to the necessity of preparing by the purchase of ground, for the speedy commencement of the Ooltadanga line between the Hoogly and Salt Water Lake.

9. It appears that your purchases in the past season have been very limited in consequence of the prohibition to make payment otherwise than in notes for two years, bearing 5 per cent. interest.

10. In full confidence that expedition in the purchases will be a measure of ultimate economy, and that much of the outlay will be recovered by resale of the ground not required for the Canal, His Lordship in Council consents to remove that restriction, and to authorize the completion of purchases for cash to the extent of 3 Lacks of Rupees in the present season.

11. A Treasury order will accordingly be issued in favour of the Committee to the Sub-Treasurer, to enable him to meet the drafts of the Committee for the purpose in question.

12. The Superintendent of Canals is authorized to continue the two Sircars entertained by him for Mofussil duties, at an expense of 66 Rupees per mensem, for such period as he may require their services, and to employ F. Mullins, as an Overseer, with a Salary of 30 Rupees per mensem from 1st of July last. The pay of these to be disbursed in the same manner as the present Establishment.

13. His Lordship in Council will be prepared to sanction the permanent employment of a practical Mechanic on the establishment of the Superintendent as soon as Lieut. Prinsep may meet with a steady person properly qualified for the duty.

14. The original Plans and Bills which accompanied your Letter are herewith returned.

[I am &c.,
(Signed) HOLT MACKENZIE,
Secretary to Government.]

(No. 87. to No. 95. inclusive, omitted.)

No. 96.

No. 112.

To MAJOR J. N. JACKSON,

Secretary to the Canal Committee.

SIR,

I have the honour to Report to the Committee, for the information of Government, that I have been under the disagreeable necessity after unremitting exertions, to prevent much disappointment, of abandoning as hopeless, the operations for closing the Kulloar Salt River, during the present season.

The Committee are already aware of the chief difficulties attending the undertaking—viz. the great depth and section of the water-way; the rapidity and great rise and fall of each tide; the nature of the soil from which the earth has to be excavated; and the locality of the place, two miles within the limits of uncultivated jungle.

Other difficulties in the unusual drought of the present season, the dreadful prevalence of Fever and Cholera Morbus (from the latter of which 43 cases out of 80 terminated fatally among the coolies at Hoseinabad alone,) and added to the above, have proved fatal to my endeavours, and I am at present without hope to retrieve the loss during the remaining month of May, or indeed, if this were possible, to secure the new made earth from falling away during the rains which are so near at hand.

My intentions to complete the work, between November and February, were frustrated by the reluctance of the Coolies to work in the Jungle, while any other employment could be procured—and until the crops of the district were wholly collected in January, the number of Coolies collected, notwithstanding large advances, was barely sufficient to prepare the ground for excavation and collect materials; during the month of February, the work proceeded rapidly, although the number of Coolies still disappointed my expectations. In the first neap tides of March, the Dam was so far advanced, as to give me every hope of completing it in the following neap tides, if additional Coolies could be collected. From the 15th March to the present moment, the Dam appears to have progressed very insensibly. The number of Coolies in place of 2,000, have varied between 700 and 300. It has been found impossible to exceed this number, and difficult to keep this number upon the work.

The undertaking is of that nature, that during its last stages in particular, its success entirely depends upon the unremitting exertions of a number of men, not less than 2,000, any falling off from which, must defeat the object and create the loss of their labour.

I have therefore under the circumstances, thought myself not warranted to incur any further expense during the present year.

The Committee are aware of the chief reasons which have rendered it necessary to keep the mouth of the Hoseinabad Canal closed, until some provision could be made to secure the neighbouring district from the injuries stated in the petition of Kaleenat Roy, Zemindar of the Purgunnas Myhuttee and Burreedhuttee. I have now to request instructions whether under existing circumstances it is thought advisable to excavate the mouth of that Canal, or await the result of a second attempt during the approaching year.

I have held communication with the Zemindar in question, who, although urgent for the Dam, appears unwilling to make any sacrifice of money to procure it, and have pledged myself, that no more than the necessary preparation shall be made for opening the mouth of the Hoseinabad Canal until the 15th instant, by which time, he will definitely state the extent to which he is able and willing to assist me in a second attempt to close the Kulloar Gung, in assuring the attendance of a sufficient number of men,

and what sacrifice he is ready to make to reimburse the Government, in case the expense of a second attempt prove fruitless.

The Zemeendaree of Kaleenot Roy, is the principal, although not the only country liable to injury from the admission of the salt water of the Kullooar into the River. The injury to be apprehended is not to the low lands or crops, but to the supply of drinking water, and a fancied unhealthiness to be apprehended from the proximity of salt water.

The expenses already incurred upon the work, will have attained 12,000. The accounts are not yet closed. I estimate a second attempt at not less than 15,000 Rs.

I will, without delay, apprise the Committee of the final answer of the Zemeendars as to the extent to which they are able and willing to assist in a second attempt, and have to request an early consideration of the subject, in order that in case the Governour General in Council does not deem it expedient to renew the undertaking at the sole risk and expense of Government, and that the Zemeendars prove unwilling to share either the risk or expense; I may be able to complete the excavation of the 250 feet of Canal, at the mouth of the Hosseinabad Canal between the 15th instant and 1st proximo, after which period it will become difficult.

I have only further to add my still firm conviction, that although the undertaking must by its nature, be attended with great uncertainty as depending so much upon the constant and unremitted labour of so large a body of men, (which I have found it impossible during the present unfavourable year to collect or keep together,) that there is no real impossibility in the undertaking, and that this point, the cause of the present failure, being set at rest, by the assurance of the Zemeendars, who are able, when willing, to insure the attendance of their ryots; I have little fear of the result.

I have, &c.

HOSKINABAD:
3rd May, 1828.

(Signed) THOS. PRINSEP, *Captain Engineers,*
Superintendent of Canals.

No. 97.

No. 56

To CAPTAIN T. PRINSEP,
Superintendent of Canals.

SIR,

I am directed by the Canal Committee, to acknowledge the receipt of your Report of the operations connected with the Kullooor Dam, dated the 3rd instant, and to intimate to you, that the Committee will postpone submitting it to Government until you shall have ascertained and communicated to them, the final determination of the Zemeendars regarding the extent of the aid, which they would afford you, in the event of a second attempt being made to complete the Dam, and to request, that this information may be furnished at your earliest convenience.

I have, &c.

CANAL COMMITTEE'S OFFICE,
CALCUTTA:
8th May, 1828.

(Signed) J. N. JACKSON,
Secretary Canal Committee.

No. 98.

No. 117.

To MAJOR J. N. JACKSON,
Secretary to the Canal Committee.

SIR,

With reference to my former Letter, No. 112, of 3rd instant, and your favour No. 56 of the 8th instant, in reply I have the honour to state, that the interval agreed on between myself and the Zemeendar, Kaleenat Roy's Agents, for them to determine to what extent they are willing to assist in a second attempt to close up the Kullooar Gunj, has expired, and although they appear still urgent upon the subject no document has yet been submitted by them, as therefore it appears to me, that their chief object is to create a delay that may render it impossible to excavate the mouth of the Hossynabad Canal during the present season. I beg leave to submit with deference to the Committee, the propriety of soliciting the orders of the Governor General in Council upon the subject, without further delay. The Zemeendars will probably come to a more speedy decision, when they find the subject under the immediate attention of Government, and should their answer be favourable, I will lose no time in forwarding the petition.

I have, &c.

SUPERINTENDENT OF
 CANALS' OFFICE:
 19th May, 1828.

(Signed) THOS. PRINSEP, *Captain Engrs.,*
Superintendent of Canals.

True Copies.

J. N. JACKSON,
Secretary Canal Committee.

No. 99.

No. 68.

To H. MACKENZIE, ESQ.,
Secretary to Government.

Territorial Department.

SIR,

I have the honour by desire of Canal Committee, to transmit for the information of Government, a copy of a Letter from Captain T. Prinsep, Superintendent of Canals, dated the 3rd instant, reporting his having been reduced to the necessity of abandoning for this season, the operations which he had commenced, with every prospect of ultimate success, for closing up the Kullooar Salt River, near the point where it is intersected by the line of Canals constructing under his superintendence.

The Committee have delayed bringing this subject to the notice of Government, until they had ascertained by a second Report from Captain Prinsep, dated the 19th instant, (a copy of which, as also of my letter to which it is a reply, I have the honour to annex) how far it would be practicable and expedient, to make another attempt this season, towards completing the Dam, with the assistance which Captain Prinsep anticipated would be afforded him, by certain interested Zumeendars, who had entered into treaty with him apparently for that purpose.

As it appears, however, from Captain Prinsep's last communications, that any renewed efforts to complete the work before the rains have set in, must be made entirely at the expense of Government, the Committee are decidedly of opinion, that it would not at present be justifiable to incur the risk of further pecuniary loss, by attempting to prosecute the work.

Before the approach of the ensuing working season, the Committee will be prepared to offer for the consideration of Government, the result of their deliberations relative to the expediency or otherwise of reconstructing the Kullooar Dam.

In submitting Captain Prinsep's Report, the Committee are anxious to express their opinion, that the failure of the attempt to construct the Dam this season, has arisen entirely from circumstances over which that Officer could not possibly exercise any controul, some of these are enumerated in Captain Prinsep's first Letter, and the Committee in adverting to them feel assured, that Government will exonerate from all blame, an Officer, who on every occasion coming under this Committee's observation, has manifested the most meritorious zeal and perseverance, at the risk of his health, arising from constant personal exposure.

I have the honor to be,

Sir,

CANAL COMMITTEE'S OFFICE, CALCUTTA :
22nd May, 1828.

Your most obedt. Servant,
J. N. JACKSON,
Secretary Canal Committee.

No. 100.

(No 119)

TO MAJOR J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

SIR,

I have now the honor of forwarding the petition of the Zemindars of Myhattee and Augurpara Purgunnahs. As the subject of the extent of injury likely to occur upon opening the Hoseinabad Canal to the adjoining district has already been fully expatiated upon by Major Schalch, in his correspondence in the years 1823-24, it would be superfluous to enter into any further explanation.

The petitioners magnify the danger, and perhaps their terrors are natural with the view of what has happened in their immediate neighbourhood to the Dholyapoor Purgunnah, by the influx of salt water through the new cut excavated by the late Lieut. Morrieson of Engineers, in the year 1812 or 13. The relative local circumstances of the district will guarantee them against any such general injury ; indeed there are few tracts of low ground, in the two Purgunnahs named, which are not above the influence of any high tides during the months of March to June.

The parties petitioning, notwithstanding their professions to me personally, appear after a more mature consideration unwilling to make any sacrifice to gain their objects, or to share any portion of the risk of failure that must attend such a work, and their offer of assistance is too inconsiderable to allow me to reckon upon any greater advantages than I possessed during the present year. The number of Coolies I consider indispensable to the success of the work is 2,000, or upwards. I shall therefore still have to collect from a distance 12 to 1500, and as all other Zemeendars within 5 to 10 miles, are indifferent upon the subject, desertion from sickness or unwillingness to work at so unfavourable a spot, may place me in the same circumstances that have caused the failure of the present year.

I have, &c.

CALCUTTA, SUPT. CANALS' OFFICE :
30th May. 1828

(Signed) THOS. PRINSEP, Capt.
Superintendent of Canals.

No. 100. *a.**(Translation.)*

To CAPTAIN THOMAS PRINSEP,
Superintendent of Canals.

The Humble Petition of Kaleenauth Roy, &c. &c. Talookdars Purgunnah Augur Parrah, Myehattee, &c. in the Jurisdiction of the 24-Pergunnahs.

Your Petitioners most respectfully beg leave to submit to your Honour, that when Major Schalch issued orders to open the mouths of the new Canal of Hoseinabad, they having foreseen the danger, wrote him a petition stating that without first shutting up the mouths of the Salt Water Lake, the union (being lengthened of the new Canal with the River Jumna,) would occasion a considerable Lona Shakestee and the Ryots (their periodical produce of vegetables being destroyed) would consequently suffer an inevitable ruin. The people and beasts live by drinking the River (Jumna) water and if the water of this River be impregnated with Salt, of course not a man would be in existence on account of fresh and good water, and these well cultivated Lands would be desolated, as well as those places that contain the habitations of your petitioners.

Major Schalch having from ocular demonstration taken this serious matter into his consideration, and having likewise foreseen the fatal consequences of such a measure, recommended a compliance with the request of your petitioners on his making a Report to the Governor General in Council.

Government were pleased to authorize a compliance with your petitioners' request, and desire Major Schalch to have (in the first place) the mouths of the Salt Water Lake shut up, and then open those of the new Canals.

Your petitioners enjoyed peace from the issue of this order down to the present time, when your Honour has lately sent Coolies to open again the mouths of the Canal.

Should the new Canal be extended without previously stopping the mouths of the Salt Water Lake, there is no doubt of the total destruction of the Pergunnahs and an interruption to the habitation of people in general.

For the reason above assigned, your Honour will be graciously pleased to shut up the mouths of the Salt Water Lake and then begin extending the mouths of the Canal in question, for the benefit of the Country as well as for the health and comfort of your petitioners.

If the want of Coolies is complained of, your petitioners are ready (for this transaction) to provide with 7 or 8 hundred Coolies on their being paid from your Treasury.

The 11th Joistee, 1235, Bengal.

No. 101.

To SECRETARY CANAL COMMITTEE.

Revenue.

SIR,

The 29th May, 1828.

I am directed by the Honourable the Governor General in Council to acknowledge the receipt of your Letter, dated the 22nd instant, with its enclosures, relative to Captain Prinsep's operations connected with the Kulooar Salt Lake, and to communicate as follows—

2. The failure of the undertaking must of course occasion regret and disappointment; but nothing seems to have been wanting on the part of Captain Prinsep, whom the Governor General in Council therefore exonerates from blame. In considering, however, what is further to be done, it appears to the Governor General in Council, that all thoughts of renewing the attempt at the expense of Government must be relinquished; and it seems

to be very unlikely that the parties interested will agree to bear the charge: since besides the uncertainty of success, the object in view (a supply of fresh water) can probably be better and more cheaply attained by constructing Tanks. Now to keep the mouth of the Hoseinabad Canal closed during another rainy season, will, it is understood, occasion considerable inconvenience and expense; and unless therefore the parties above referred to, have, or immediately do, come forward with some distinct proposal satisfactory to your Committee and to Captain Prinsep, the Governor General in Council is of opinion, that that Officer should be authorized to excavate the mouth of the above mentioned Canal without delay.

I am, &c.

(Sd.) H. M.

[*Secretary to Government, Territorial Department.*]

No. 102.

No. 130.

To CAPTAIN J. N. JACKSON, A. Q. M. G.

Secretary to the Canal Committee.

SIR,

Having now closed the operations of a second season, I have the honour to submit my observation upon the different objects that have engaged my attention, and my remarks upon the scale of expense with which they have been attended.

2. In the scheme of operations submitted in my Report of last August, although I included in my estimate the whole length of Canals required at Bhowaneeppoor and Bahmunghatta, to open a new line of communication between the Salt Lake and Eshamuttee: I then expressed some doubt of my being enabled to complete the whole in one season on account of the difficulties that usually attend excavating through a tract of jungle, in collecting and retaining great number of workmen in places so remote from their houses, and so destitute of every comfort and necessary to their health and subsistence. The very unusual insalubrity and drought of the present dry season, has occasioned much greater disappointment in the progress of the works than I could have anticipated under any possible circumstances.

3. I have been unable to complete either of the Canals at Bhowaneeppoor or Bahmunghatta, besides the unfortunate failure of the Dam across the Kulloor Gong, which may be ascribed with justice to the same cause, and there will remain a length of upwards of 3½ miles of Canal to excavate in the approaching season before the new line of navigation can be opened to the trade of the Sunderbuns.

4. In the General Abstract of Expenditure which accompanies this Report, it will be seen, that I have left undrawn a large sum* of the assignment granted for the expenditure of the season, and that there remains as balance, partly in hand and partly to be recovered from the different contractors, a farther sum to stand over to the approaching year.

* Sa. Rs. 26,000.

5. The result of the present year's proceedings has impressed me more than ever with the truth of the remark I had the honour to make upon the method of conducting Canals under the circumstances of those at Bhowaneeppoor, and the last 2 miles at Bahmunghatta.

6. In both these districts, the population of the immediate neighbourhood is engaged in the manufacture of Salt. Tanks of fresh water are scarce, and barely sufficient for the subsistence of the inhabitants; who, in very dry seasons, are left dependant upon a few shallow pools of muddy and half brackish water—under such disadvantages, it appears to be indispensable to the economy and success of the undertaking to conduct the excavations

slowly and cautiously, assembling only such numbers of Coolies as I can provide with the means of living with some degree of comfort; and with this view (as also that they may be under my own superintendence rather than of a contractor,) I shall henceforward with the approbation of your Committee, work with daily Coolies upon a daily measurement of work done as at Bhowaneepoor during the present year; a method which secures me against any portion being left imperfect, at the close of the season, besides not being attended with any great additional expense.

7. The arrangements which I have made to ensure a supply of fresh water to the works will, I trust, enable me to finish the remainder of the line of Canals required for the new route between the Lake and Hoseinabad, with the exception of the Canal alluded to in my last year's Report, and described in the Plate No. 3 C. accompanying that Report by the letters X. Y. upon which I could not commence until the Bhowaneepoor Canal is finished.

8. The Committee may not, without some justice, consider that the aggregate of work executed during the two seasons, bears a very unequal ratio to the expense of the whole Canal Establishment; such is also my own view, and I cannot therefore refrain from hazarding a few remarks in explanation of the causes.

9. In the first place, of the funds sanctioned for the executive part of the undertaking, a moiety only has to be expended upon the works Eastward of the Salt Water Lake. From the extent of Country over which this work has to be conducted; from the various local difficulties, (the part commenced being the most difficult and precarious of the whole undertaking) and the caution necessary in superintending such work at many distant places, I have been obliged to proceed more leisurely and cautiously than could have at first been wished, to prevent a total failure and great loss which might have been entailed by embarking too precipitately in such work.

10. The remaining half of the funds are to be expended upon a work (the Circular Canal) of by far greater importance and also easier execution; the progress of which can in no way interfere with the Mofussil operations.

Upon this portion of the undertaking, I have as yet made no commencement, the ground not having been at my disposal.

11. The two late seasons therefore which might have brought this important part of the undertaking to such a state of forwardness, without detriment to the progress of the rest, may be said to have been lost to one-half in point of time, and it cannot therefore be wondered at, that a proportionate addition to the original contemplated expense on such head, and delay in completing the work, should occur.

12. Although the purchases contemplated at the beginning of the year are still not effected, I am happy to say that there appears to be a prospect of a good portion of the line being placed at my disposal in a few months; and that I shall be able shortly to proceed in my yearly labours in a more satisfactory way to myself and my employers.

13. The Committee knowing the very superior importance I have always attached to the Circular Canal, in the ultimate advantages that are to be expected from the whole scheme of Canals proposed by my predecessors, will not be surprised at my having watched with more than common anxiety the progress of these purchases conducted by their own establishment. The members of the Committee appear very justly to hesitate to enforce the Regulation of Government, regarding the occupation of land for such purposes, if the negotiation can be conducted by any other means, and reserve it as a last resource.

14. In the Resolutions of Government, Territorial Department, of 20th March 1823, paragraphs 13 and 14, from which perhaps this hesitation has originated, the line is carefully drawn between the purchase of property which is indispensable to the work itself, and of property to be purchased with a view to profit on the resale, and only of a second-

any consideration in the undertaking. It appears to me that unless other means are procured of disposing of the earth of excavations, the whole breadth allotted of 400 feet is absolutely indispensable to the Canal, and that it would be impossible to carry it on in a narrower space. In the list of properties which I had the honour to forward with my Letter of November 9th, 1826, and upon which, with a few deviations, I believe the proceedings are conducted, I carefully limited myself to this space, and even omitted some properties, the parts of which intruded into that space whenever the property marked for purchase on the opposite side, afforded an equivalent vacant space to make up the deficiency.

15. I believe, moreover, that the chief difficulty and delay has occurred in treating with those proprietors whose grounds are more directly necessary, as in the case of the lot No. 31, of Letter E., and I have therefore more particularly felt alive to the necessity of enforcing the regulation in one or two such cases in which there cannot exist a shadow of injustice. It has also ever been my impression, that an arbitration equitably and fairly conducted would award even a less price than any obtained by negotiation.

16. The papers relating to the design for the Circular Canal, still want the final sanction of the Governor General in Council, being yet in circulation among some individuals, whose opinion it has been thought advisable to obtain. This will not, I trust, create any extra delay, and the Committee will, I am confident, second my great anxiety for embracing, some portion at least, of this work in my operations during the approaching season, unless circumstances place it wholly out of their power.

17. I now proceed separately to the several works which have been conducted by me during the season, to which I have added a scheme for the approaching years' operation, accompanied with an Estimate of the Funds required for the purpose. The remarks are accompanied by one Plate No. 5 E. which I have to request may be forwarded in original, with the remarks when forwarded for the inspection of the Governor General in Council. I have also to request, that the original Plate No. 3 No. C. of last year, showing the Bhowaneeepoor line, remaining in your Office may be forwarded in illustration of the remarks upon that Canal; also Plate B. in illustration of the remarks upon the state of the Chaltabarya Canal.

I have, &c.

CALCUTTA, SUPT. CANAL'S
OFFICE,
22nd August, 1828.

(Signed)

THOS. PRINSEP, *Captain Engineers,*
Superintendent of Canals.

No. 103.

No. 110

To H. MACKENZIE, ESQ.,

Secretary to Government, Territorial Department.

SIR,

I have the honour by desire of the Canal Committee to submit herewith, for the information of the Right Honourable the Governor General in Council, a Letter from Capt. T. Prinsep, Superintendent of Canals, dated the 22d ultimo, with annexed Reports of his operations on the Eastern line of Canals, during the seasons 1827-28, and on other works of a minor description connected herewith, upon which, during that period, he has also been engaged.

These Reports are accompanied by an abstract Statement shewing the total sum drawn on account of the several works collectively, and the amount expended on the particular branches which were either completed or commenced upon during the season. Also, a list of outstanding Balances and Plans, and Sections of three principal works upon which Captain Prinsep has been employed.

The Committee in bringing these Reports and Plans to the notice of Government, have to remark, that the operations of the past season generally have not been attended with that degree of success which they had hoped for, but when the unfortunate train of circumstances detailed by Captain Prinsep, are taken into consideration, it will at once appear evident, that, the causes, which tended to retard the progress of the several works were such as no human foresight could have guarded against. The Superintendent has in his statements evinced the greatest candour, and the Committee think it due to him to say, that the fair and open manner in which every thing is described, is as creditable to him as the zeal, ability, and perseverance he has uniformly displayed in the conduct of the important duties entrusted to him.

The Committee had expected in the course of this year, to have witnessed the completion of the whole line of Canal between the Salt Lake and the Eeshamutty River, and the consequent benefit to the Eastern trade, which would have resulted from this safe and direct approach to Calcutta, being thrown open to Boats which are now compelled to resort to the circuitous and dangerous Nullahs, forming the old navigable track through the Sunderbunds; but from the Report submitted by Captain Prinsep, they learn, that about $3\frac{1}{2}$ miles of the new route still remains untouched, chiefly along the lines of the Bamingatta and Chultabarya Canals.

In the margin is inserted, a List of the works which have engaged the attention of the Superintendent throughout the season, and the Committee will proceed to notice them as there arranged.

1st. Dredging operations and Machinery.

2d. Bahamingatta Canal between Goanamagee and Kantatulla.

3d. Chultabarya Canal and works connected with it.

4th. Bhowaneepore Canal.

5th. Kullooar Dam.

6th. Eastern or Entally Canal Roads, and other miscellaneous works.

1st. DREDGING OPERATIONS AND CONSTRUCTION OF MACHINERY.

The Dredging of the entrance to the Balya Ghaut Canal and Channel through the Salt Lake, has been carried on in a very satisfactory manner; an increased depth of from one and a half to two feet, in this passage, is already perceptible, excepting at one point where the soil has been found of a harder nature than elsewhere, extending to a length of about 300 feet, but with the aid of the new Dredging which has now been brought into use, the Committee are led to expect that in another season, this Channel will be sufficiently deepened to admit of the free navigation of it by Boats of the largest class.

The expences* of maintaining the Establishment and workmen attached to the apparatus, and purchasing a new Boat to replace one that

* Amount actually expended,	4291	12	5	$\frac{1}{2}$	had from decay become useless, has in the year
Ditto Estimated,	4000	0	0		amounted to somewhat more than the sum Estimated.
Excess,	291	12	5	$\frac{1}{2}$	

The new Dredging Machinery has also been completed for nearly the sum† authorized by Government, and but for the unfortunate des-

† Amount authorized,	Rs.	8000	0	0	truction by fire, of a part of this Machinery when
Ditto expended,	8601	9	3		nearly completed, as communicated to Government,
Excess,	601	9	3		

in the Committee's Letter of 15th May last, they would have had the satisfaction of reporting a considerable saving in the amount assigned for its construction.

2nd. NEW CANAL BETWEEN GHOONAMAGEE AND KANTATULLA.

That part of the Bahamingatta Canal situated between Ghoonamagee and Kantatulla, (vide Plans and Section E. No. 5) of about 17,500 feet in length, has been but partially excavated, 7,000 feet having been completed and opened for the admission of the Tide, and nearly 5,000 feet between the points B. C. on the plans, have been cut to the required depth, excepting at two or three places as shewn on the Section, where the contractors have left the excavations in an unfinished state. This portion of the work, however, as well as the other partial cutting between C. and D. on the Section, had been managed by Capt. Prinsep in a very judicious way, by being converted into Fresh water Reservoirs, for the

supply of his people during the ensuing working season. The want of this most essential necessary of life having been severely felt throughout the greatest part of the past working seasons. The rate per Chowkah at which the excavations in this quarter have been effected

for two years* past affords the most satisfactory grounds for concluding that the estimated rate of 10,000 Rupees per mile, will not be exceeded. The total disbursements on this

Canal for the season have amounted to Rs. 21,926 including a large outstanding† balance, which Capt. Prinsep states he is making great progress in recovering from defaulters on their contracts.

† Rs. 3,157:6:4.

3rd. CHULTABARYA CANAL AND WORKS CONNECTED WITH IT.

Capt. Prinsep has, on this work, been chiefly employed in endeavouring to complete what he had left in an imperfect state on the close of the season 1826-27, owing to the strata of oozing sand, which had been found in some parts of the line, at a depth of even 5 feet‡ below the high water mark of neap tides, and through which it was found impossible to carry the excavations.

‡ Vide Plan and Section B. No. 2.

The mode suggested and put in practice by the superintendent for removing this obstruction, viz. the introduction of a strong current of water into the unfinished bed of the Canal, has evidently had the effect of clearing it out to a considerable extent already, and the Committee are of opinion, that the continuation of the method will be found extensively useful. The whole line of Canal ground from the Salt Lake to Koolna being at intervals intersected by ridges or beds of the same kind of oozing sand, which it has been found quite impossible to remove or penetrate through effectually by mere manual labour.

Capt. Prinsep has expended in excavating between the points A. and B. (vide plan) of this Canal and in deepening and enlarging the Bungur Nullahs which forms a continuation of it to the Eastward, the sum of Sa. Rs. 2,550, in this charge is included, the cost of excavating 1000 running feet of the Nullah which connects the Chultabarya to the Bahamingatta Canal.

4th. BHOWANEEPOOR CANAL.

Although the excavations on this line have been carried on under Capt. Prinsep's immediate superintendence by daily workmen, a cut of only 3700 feet has been completed, owing to the limited number of workmen which it was found possible to collect or keep together on account of the unhealthiness of the season, and the consequent sickness that existed, causing a panic in the minds of the labourers which could not readily be overcome.

The rate§ at which the excavations in this work have hitherto been effected is much above what the Canal has cost in other quarters, but this would appear to be altogether owing to its being one of the most difficult portions of the whole undertaking occasioned by local circumstances.

§ 3700 feet costs Rs. 12,293 or Rs 17,524 per mile

The unfinished portion of this Canal (6300 feet) is included in the scheme of operations for next year, and Capt. Prinsep expects to be able to complete it within the season at a rate per mile not exceeding Rs. 15,000.

5th. THE KULLOAR DAM.

The failure of the attempt made by Capt. Prinsep to construct a Dam or Bund across the Kulloar Gong or Tide Channel, has already been reported|| to Government. The Committee will therefore abstain from offering any remarks upon the subject, particularly as Capt. Prinsep has entirely excluded it from the scheme of operations, he purposes with the sanction of Government to carry into effect during the approaching season.

|| Date of Report 22nd May, 1828

6th. EASTERN OR ENTALLY CANAL ROADS, &c., &c.

The repairs and additions to the Roads along this Canal were very urgently required, and the Committee have great satisfaction in stating that they have been executed in a manner that merits their entire approbation. The mode which Capt Prinsep has adopted for

widening that part of the Road immediately opposite the principal wood mart, where it had: scarcely a breadth of 12 feet by carrying out the bank of the Canal, instead of encroaching on the huts and ground forming the site of the Bazar as at first proposed, is deemed a very material improvement on the original plan—600 feet of the Canal itself, which for a long period had been perfectly inaccessible to Boats of even the smallest burthen, have also been greatly improved, by being excavated to a depth that will admit of their now coming up its whole length to deliver their cargoes, a point of most material importance and benefit to the

* Estimate for repairing the Roads, .. Rs. 1,690 0 0
Amount expended on above account and deepening 600 feet of the Canal, 2,072 6 5
Excess, 382 6 5

community at large. This latter contingency not having been provided for, the Road Estimate has been exceeded* in the sum shewn in the margin; an amount unworthy of notice, when coupled with the very great advantages that have accrued from the execution of this work.

The obstructed state of Tolly's Nullah, and the experimental measures that were proposed by Capt. Prinsep for increasing the depth of water in this thoroughfare, were brought to the notice of Government on the 15th of October last, and on the 25th of the same month, Government was pleased to authorize a trial of the plans suggested by Capt. Prinsep. The Dams and Shutters proposed by that Officer were accordingly constructed at two points on the Nullah, at a considerable distance from each other, but the very trifling benefit that resulted from the use of the Dams and Shutters justifies the entire abandonment of the plan. The Committee therefore must look to other more efficacious measures for rendering this Nullah fit for the purposes of navigation, and which they are of opinion can only be effectually resorted to when its course shall, by the opening of the new cuts, be less obstructed than at present. The actual cost of this experiment has exceeded the

† Estimate Rs. 400
Outlay, 469 2 4
Excess, 69 2 4

Estimate† by the trifling sum of Rs. 69 : 2 : 4.

The total amount assigned by Government for carrying on the Canals and other works for the past season, was Rs. 1,00,607 : 9 : 7½, of this sum Capt. Prinsep has only drawn Rs. 74,000, so that a balance of Rs. 26,000 : 9 : 7½ is available for the ensuing year's operations, and the Committee beg to recommend that funds may be assigned to the extent required by Capt. Prinsep in sufficient time to admit of his recommencing work at as early a period of the season as may be practicable.

The total amount of Capt. Prinsep's Estimate is Rs. 54,650, deducting from that sum the two items specified in the margin‡ a balance of

‡ Undrawn Balance of assignment dated 27th September 1827, for operations of 1827-28, 26,000 0 0

Cash Balance in Capt. Prinsep's hands, 1,042 8 10

Total available assets, .. 27,042 8 10

Amount of Estimate for ensuing season's operations, .. 54,650 0 0

Amount for which an assignment is required, 27,607 7 2

Rs. 27,607 : 7 : 2 is exhibited, being the amount for which an additional assignment is required. The observations which Capt. Prinsep has made in the 13th and three following Paragraphs of his Letter, in allusion to the duties which fall immediately and exclusively within the province of the Committee, they cannot deem otherwise than unnecessary, and which had better have been omitted, with reference to the executive situation he holds under the Committee.

The purchase of Land along the line of the proposed Oultahdanga Canal, simple and easy as the process may appear to others, has entailed a degree of labour and anxiety upon the Committee, that they little expected, considering that the means of obtaining the Lands upon fair and equitable terms were liberally placed at their disposal, as also, the power of enforcing the surrender of particular properties, where a refractory or avaricious spirit might shew itself to the hindrance of their labours, and the ultimate retardment of the great object which Government had in view. The powers vested in the Committee by

Regulation I. of 1824, they acknowledge they were reluctant to enforce, where the most distant hope of effecting their purchases by negotiation appeared to exist, and it is not the least pleasant part of their task, to be able to assert, that with one or two exceptions the whole of the Lands purchased by them have been obtained at prices even below what had been originally* Estimated, and without the aid or intervention of the Regulation above quoted, or recourse to any measure of harshness whatever. It is doubtless true, that many and very annoying delays have occurred, owing to the combination amongst the proprietors of Land in this quarter, their proneness to litigation and chicane and their amazing ingenuity in devising Plans and subterfuges calculated to mislead and deceive the Committee's Agents and very often themselves; but it is not apparent to the Committee, that the interests of Government have suffered by this delay, for even up to the present moment, it is undecided to which of the two Plans of this most important part of the whole undertaking that have been brought to the notice of Government a preference shall be given. The Committee take this opportunity of stating that the memoir, &c., drawn up by Capt. Prinsep on this subject, has agreeably to the orders of Government of 6th December 1827, been circulated amongst persons of acknowledged scientific acquirements, who have all, with the exception of one, recorded their opinions, which opinions would ere this have been laid before Government with the Committee's final sentiments regarding them, were it not, that they are still awaiting a reply from an individual possessing high attainments, and general acquaintance with undertakings of this kind, but who has been hitherto prevented by ill health and other causes from devoting his attention to the subject, he will, however, be requested to favour the Committee with the result of his deliberations at such early period as will preclude the possibility of any delay being caused in the operations of the year.

* 60 Rs per
Cottah.

The Committee might adduce as another and very cogent reason for the caution they have observed in resorting to the powers of the Regulation in every case where they might have done so, the circumstance of its being more than probable from the rapid manner in which the value of land has increased in and around Calcutta, that arbitrators would have awarded a considerable higher price for the lands required than the Committee has in any instance paid since the commencement of their purchases, and one such award would have entirely destroyed the Committee's hopes of fulfilling their duties in an economical and pacific manner.

An apprehension of enhancing the demand for the land not yet obtained, has operated powerfully with the Committee in inducing them to defer commencing any part of this Canal, until the whole of the required Lands should be secured by purchase; they have now, however, the fairest prospect of attaining this object in sufficient time to admit for the ground being cleared and ready for excavation next season.

The quantity purchased since the date of their last Report, has amounted to 173 B. 12 C. 4½ C. Biggahs for which they have paid, including the value of Buildings, Rupees 2,20,836:11:0.

† 10th September,
1827.

There yet remains about 196 Biggahs to be obtained, but as the Committee have still funds at their disposal to the amount of Rupees 48,709:5:0, they will defer calling for a further assignment until they have nearly expended the sum above mentioned.

I have, &c.

CANAL COMMITTEE'S OFFICE, CALCUTTA:

(Signed) J. N. JACKSON,

8th September, 1828.

Secretary Canal Committee.

P. S. The List of outstanding balances. Abstract statement of Expenses, and Plans which accompany this Report, being all Original Papers, I am directed to request that they may be returned when no longer required by Government.

(No. 104. and No. 105. omitted.)

No. 106.

To MAJOR J. N. JACKSON,

Secretary Canal Committee.

Territorial Department—Miscellaneous, Revenue.

SIR,

I am directed by the Governor General in Council to acknowledge the receipt of your Letter No. 110, dated the 8th ultimo, together with the detailed Report and maps submitted by the Superintendent of Canals, in explanation of the result of his operations in the past season and on the works proposed for the ensuing year.

2. Though in some respects the operations of the year have disappointed expectation, His Lordship in Council sees every reason to be fully satisfied with the management of Captain Prinsep.

3. The Governor General in Council approves and sanctions the Estimate submitted by Capt. Prinsep, for the several works proposed to be executed by him during the approaching season 1828-29, amounting in the aggregate to Rs. 54,650, an order will accordingly be issued on the General Treasury in favour of the Sub-Treasurer for the Sum of Sa. Rs. 27,607: 7: 2, to enable him to pay the same to Captain Prinsep as required by him.

Amount of Estimate	54,650	0	0
Deduct Balance in			
Captain Prinsep's			
hands,	27,042	8	10
Sa. Rs.	27,607	7	2

4. In regard to the purchase of Land in the vicinity of Calcutta, his Lordship in Council has the fullest confidence in the judgment and zeal of the Committee, whom he considers entitled to the cordial acknowledgements of Government for that, as for every other part of their labours in aid of this important undertaking.

5. The Original Papers and Plans which accompanied your Letter are herewith returned.

I am, &c.

COUNCIL CHAMBER:
The 2nd October, 1828.

(Signed) HOLT MACKENZIE,
Secretary to the Government.

(No. 107. to No. 112. inclusive, omitted.)

No. 113.

No. 159

To CAPTAIN J. N. JACKSON,

*Assistant Qr. Mr. General,
Secretary to the Canal Committee.*

SIR,

In considering the details connected with the Circular Canal now in progress, I have been induced to recast the Scheme originally sanctioned, and now remaining as my instructions, for the construction of the various Bridges that will cross the Canal. The Craft that usually Navigate the Soonderbuns and Tolly's Nulla require a great loftiness of Bridge and most of them are masted. The level of the present Roads, Sambazar, Manicktulla, Ramlochun, and Balya Ghat, will not afford sufficient height above the surface of what the Canal waters will be, without very considerable raising, which is always an objection in the approach to a Bridge.

It would unquestionably be a great advantage to allow every description of Craft, even rigged Pinnaces, to navigate the Canal without the necessity of dismasting or unrigging their rudders as constantly necessary with Native Boats. Upon these several considerations I am therefore of opinion, that it would be more advisable to substitute for the Suspension Bridges proposed, Draw Bridges, well balanced and readily lifted by a single hand.

I have the honor to forward a Sketch* of some such mode of construction as will probably be thought most fit for the purpose. The design leaves two clear water-ways of 30 feet each, and tracking paths under the Bridges. One of which is made to lift with a double flap, the other to remain a standing Bridge of timber. The design will not require the Road levels to be raised above their present standard more than 4 or 5 feet at most. The expense of such a Bridge will be even less than one of Suspension, besides its being easy of repair.

If the Committee concur with me upon the superior advantages of such a mode of construction, which I understand is the most usual in Holland, where inland communication is almost entirely carried on Canals, I have only to request, that it may be brought to the earliest consideration of the Government; that, if possible, I may be enabled to commence the foundations of the two first during the month of April of the present year.

* This Sketch is in the Office of the Military Board J. M.

I have, &c
(Signed) THOS. PRINSEP, Capt. Engr
Superintendent of Canals.

CALCUTTA,
SUPERINTENDENT CANALS' OFFICE :
26th March, 1829.

No. 114.

No. 188.

TO CAPTAIN T PRINSEP,
Superintendent of Canals.

SIR,

I am directed by the Canal Committee to acknowledge the receipt of your Letter under date the 26th ultimo, together with a Plan of a Bridge that accompanied it.

It appears to the Committee, that the change proposed by you in substituting double Draw Bridges, with a Pier in the centre and deepest part of the Canal, is open to many objections—First, from the consequent obstruction to the water way that would be occasioned by the construction of the Pier—Secondly, from its being exceedingly doubtful whether a Pier of the dimensions stated in your Plan would be sufficiently strong to resist the concussions that it would be liable to, from the numerous heavy wood Boats that are likely to be employed in the Canal Navigation—Thirdly, that the supervision of the Bridges would render it necessary to entertain an Establishment, by whom, very vexatious exactions may be made, or, the raising and falling of the flappers be left to ignorant and heedless Boatmen, who would think of nothing beyond effecting a passage through the Bridge.

As far as the raising of the Road levels is concerned, the Committee apprehend, abundant materials will be produced from the excavations of the Canal, and which, of course, have already been estimated for, as applicable to that purpose.

Previously to a reference on this subject to Government, which will probably become necessary, the Committee have deemed it advisable to refer these objections to your

consideration ; in order to ascertain whether any means existed of obviating them altogether, or of materially lessening the inconveniences that seem to the Committee inherent in the Plan suggested. It need scarcely be observed, that the paramount object to be consulted is the safety and accommodation of the community, which would, in the apprehension of the Committee, be liable to some diminution, if indeed they were not exposed to hazard, by the substitution of Draw Bridges for those on the Suspension principle. It might be useful in your reply to advert to the comparative expense of the former and the latter, in order that in the event of a reference to Government, the whole subject might be presented for consideration in a complete form.

CANAL COMMITTEE'S OFFICE,
CALCUTTA :
The 3rd April, 1829.

I have, &c.
(Signed) J. N. JACKSON,
Secretary to the Committee

No. 115.

No. 160.

TO CAPTAIN J. N. JACKSON,
Secretary to the Canal Committee.

SIR,

I have the honour to acknowledge your Letter of 3rd instant, conveying the sentiments of the Canal Committee upon the alterations suggested in the construction of the several Bridges across the Circular Canal. Not apprehending when I forwarded the proposition, that the objections now urged against the change of construction could have had such weight in the considerations of the Committee, I then thought it unnecessary to enter more fully into the relative advantages of the two Plans. I am therefore much relieved by the indulgence of the Committee in referring this subject, on which they hesitate to concur with me in the preference of Draw Bridges, that I may state more particularly my views on the subject.

2. The first objection urged in your Letter is on the score of obstruction to the free passage of the water by the position of a Pier in the centre, or what they naturally suppose the deepest part of the Channel ; the Committee have not probably adverted to the scheme submitted and sanctioned for the details and management of the Circular Canal,—the construction of the Chitpoor Gates, which are to have two openings of 24 feet each, with a Pier in the centre ; and the manœuvring of the ebb and flood Gates, by which the tide will never be allowed to run with any thing beyond a very moderate velocity, sufficient only for the purpose of cleanliness.

3. In the Sketch accompanying my Letter of 26th ultimo I have delineated the section of the Canal, purposely to show how little contraction of water way will be necessary, and I believe it cannot be said by any person conversant with the subject, that a diminution of $\frac{1}{12}$ th from the average section can have much prejudicial effect in the free passage of the water, where the current will remain so slack.

4. The second objection relates to the dimensions of the Pier, which the Committee fear may be insufficient to sustain any violent concussion from the heavy laden Craft which are likely to frequent the Canal. This objection has probably arisen from what the Members of the Committee have witnessed so often in Tolly's Nulla, where these Boats are constantly allowed to drift with the full velocity of a current of two to three miles an

hour without any check or control but that of a bamboo luggee or pole. Even under these circumstances, I should consider a Pier of six feet beyond the fear of being destroyed by such concussions, unless the height were much greater than at present proposed.

5. Generally speaking, where a Navigation is carried on by tide or current without assistance from the Banks, I acknowledge there exist great objections to a divided water-way ; but even in Tolly's Nulla, where the tide has so much comparative velocity, the passage of Boats is for the most part confined to one side of the Nulla, while the other side is lined by Craft at anchor, the centre remaining unoccupied. And it must be kept in mind, that in the Circular Canal, where the current will be moderate, and the use of the track rope more frequent, this division of the stream will still more obtain.

6. The third and last objection is one of more weight, and which I had not neglected to consider. In the Sketch forwarded I had designedly left a clear height in ordinary tides of 12 feet under the Bridges, to render the lifting of the Bridge necessary only to masted Boats or the larger Craft. Perhaps an additional 3 or 4 feet making this height 15 or 16 feet instead of 12, may be advisable, and it cannot add much to the expense of masonry required.

7. By thus limiting the necessity of lifting the Bridges, to the passage of the larger Craft having stronger crews and more wealthy owners, and to masted Vessels, such as Pinnaces and Budgerows, who are not likely to submit tamely to any illegal exactions on the part of the Chokeydars in charge ; the dread entertained against any Establishment will be much lessened if not wholly obviated.

8. No person, however, can visit Tolly's Nulla and the Eastern Canal, without being impressed with the actual necessity of some surveillance to preserve the Navigation of those Canals. In the former the evils are partly obviated by the rapidity of the current, which renders it more than hazardous to subject any Boat at anchor to the concussion of another drifting freely with the tide ; but in the Eastern Canal, there is no perceptible current, and where there is actually no Government Officer of any kind with authority to interfere, but the Native who farms the Revenue or Tolls of the Canal, possessing no other power but that of enforcing his dues, and preventing the entrance into the Canal of all who resist ; the great advantage of an Establishment are more especially felt ; the passage being frequently closed for days together with much loss of property by Boats being swamped in the confusion.

9. My remarks upon a subject which is properly beyond my province as an Engineer, will, I hope, be received with indulgence, and as dictated only by my interest in the improvement of the Canals. I should hope, that it never will be contemplated to continue the collections of the Circular Canal by the same system of farming, or if so, that the Canal may not be left in the same neglected state without Police to protect its navigation. It cannot be so difficult to prevent abuse where the Establishment required is so small and checks are so easily established, and where a general and public benefit must accrue from such an Establishment properly constituted, I should apprehend that the chance of abuses, trifling as they must be, will be more than amply balanced by the advantage.

10. The Draw Bridges over the Dutch Canals alluded to in my former letter are so nicely balanced, that any foot passenger may lift them at the request of the Boatmen passing under, and require no Establishment whatever. Few other European Canals are without bridges equally simple and readily lifted, or turning Bridges : for the advantage of allowing masted vessels to pass is too much to be sacrificed. If, however, it is thought that too great simplicity in the raising of the Bridge will place it in the power of careless Boatmen to endanger the passengers on the Road and Bridge thoroughfare, it will be easy to obviate this by an alteration in the mode of lifting the Bridge, and substituting a

crank for the present lever, to remain under charge of a Khulasee, who will possess the key, or otherwise, by altering the Draw to a Turning Bridge.

11. Concerning the relative expense of the two kinds of Bridges—Suspension or Draw Bridges, as proposed. The expense in masonry will be very nearly the same, and the difference will be that of the two Bridge-ways, iron or timber; and I am of opinion, that the former of iron will exceed the expences of the proposed design on account of its greater length—20,000 Rs. has been allowed in the Original Estimates for each Bridge of Suspension, for which sum I believe a Bridge of 100 feet span could not be constructed. The Bridges according to the Design forwarded with my letter of the 26th ultimo, will amount to about this sum.

I have, &c.

CALCUTTA, CANAL OFFICER,
4th April, 1829.

(Signed) THOS. PRINSEP, Captain,
Superintendent of Canals.

(True Copies)

J. N. JACKSON,
Secretary Canal Committee.

No. 116.

No. 189.

To E. MOLONY, ESQ.

Officiating Secretary to Government.

Territorial Department.

SIR,

I have the honor by desire of the Canal Committee to forward herewith for submission to Government, copies of a Correspondence with Captain Prinsep, Superintendent of Canals, together with the Plan in Original that accompanied it.

The Committee cannot recommend to Government the adoption of the change proposed by Captain Prinsep.

First. As the construction of a Pier in the centre of so narrow a Navigation and in its deepest part, must obviously cause very serious obstruction to the water-way, and from its being exceedingly doubtful, whether, one of such dimensions, would be sufficiently strong to resist the concussions from the numerous heavy wood Boats that are likely to be employed upon it, and a more substantial one would increase the obstruction above adverted to.

Secondly. From the liability of the materials to speedy decay, and the consequent inconvenience that must arise from the passage of the Bridge being closed, while the necessary repairs are carrying on, and when the flappers were raised, particularly in such crowded thoroughfares as those through Chitpoor to Cossipoor, Barrackpoor, Dum-Dum, and to Balia Ghaut.

Again, the adoption of Captain Prinsep's Plan involves one of the two following consequences, viz.—The management of the Draw Bridge must devolve, either upon heedless Boatmen struggling to effect a hasty passage, or an expensive Establishment must be entertained at each of the several Bridges to look after them. From the former, very serious injuries to the Bridges must be expected, and from the latter, considerable inconvenience and vexation, as they would constantly refuse to raise the flaps until some exorbitant and unauthorized demand were complied with, and whatsoever vigilance might be exercised, it would, in numerous cases, be attended with much labour and difficulty, in prosecuting the offender to conviction.

The durability and elegance of Bridges on the Suspension principle must be readily admitted, and the Committee apprehend the difficulty (if it can so be called) from the roads specified in Captain Prinsep's Letter, being on a level that will not admit of Craft going under the Bridges with their mast up, is readily and easily surmounted. As the excavations from the Canal will afford abundant material for the construction of the Road-ways up to the Suspension Piers to the level of the Bridge Platform, as is at present the case over Tolly's Nulla, at Gurreeh Haut, and Tolly Gunj.

I request the Plan, when no longer required, may be returned to the Office.

I have the honor to be,

Sir,

CANAL COMMITTEE'S OFFICE,

CALCUTTA:

The 9th April, 1829.

Your most Obedient Servant,

J. N. JACKSON,

Secretary to the Committee.

No. 117.

No. 453.

To MAJOR J. N. JACKSON,

Secretary to the Canal Committee.

Miscellaneous—Revenue.

SIR,

I am directed to acknowledge the receipt of your Letter No. 189, dated the 9th instant, with its enclosures, and in reply to communicate as follows:—

The Governor General in Council concurs with the Committee in the preference which they give to Iron Suspension Bridges over Draw-bridges of the description proposed to be erected by Captain Prinsep on the several Roads intersecting the Circular Canal, His Lordship in Council accordingly directs that the original intention of constructing Bridges of the former description shall be adhered to.

The circumstances mentioned in the 8th and 9th paragraphs of Captain Prinsep's Letter, dated the 4th instant, having attracted the notice of Government. I am directed to state for the information of the Committee, that a report on the subject will be required from the Revenue Officer in charge of the collections of Tolls in Tolly's Nullah and the Eastern Canal.

The Plan which accompanied your Letter is herewith returned.

I am, &c.

The 14th April, 1829.

[(Signed) HOLT MACKENZIE,
Secretary to the Government.

No. 118.

To MAJOR J. N. JACKSON,

Member and Secretary to the Canal Committee.

SIR,

I have now the honor to submit for the information of the Canal Committee, my Report of the progress made on the different works under my Superintendence during the past season 1828-29, accompanied by a Schedule and Estimate of the objects upon which it may be thought necessary to employ my attention during the approaching season. This report has been delayed to a somewhat later period than usual: first, on account of the state of the Accounts of the Department, which have unavoidably got somewhat in

arrears from the great accession of business accruing from the works of the Circular Canal ; and secondly, because the works of the Circular Canal have not been subjected to the temporary suspension usual on the other Canals during the rainy months, but still continue in progress, although not with the same vigour as in the dry months.

2. The scheme of Mofussil operations for the past season submitted in September last, and sanctioned at the recommendation of the Committee, embraced the following objects :—

1. Dredging operations, estimated @	..	..	..	8,400	0	0
2. Bahminghatta Canal,	..	..	..	25,000	0	0
3. Old Ghoonamagee Nulla,	..	..	..	2,500	0	0
4. Bhowanepore Canal,	..	..	..	18,000	0	0
5. Hoseinabad and Bayleygunj,	..	..	..	500	0	0
6. Balyaghat Road Drains,	..	..	..	250	0	0
Total Estimate,				..	54,650	0 0

3. The expenses which have been actually incurred upon these items respectively are as per separate abstracts :—

1. Dredging old machine,	..	..	..	3,733	4	8
Ditto new ditto,	..	..	..	2,945	10	11
					6,678	15 7
2. Bahminghatta Canal, Goonamagee to Kantatulla,	13,850	10	6			
Kantatulla to Bahminghatta,	..	..	..	9,520	11	3
					23,371	5 9
3. Old Ghoonamagee Nulla,	..	..	..	3,520	12	9
4. Bhowanepore Canal,	..	..	..	17,120	6	8
5. Hoseinabad Canal only,	..	..	..	159	15	1
6. Balyaghat Road Drains,	..	..	..	90	7	5
Total Mofussil expenses,				..	50,941	15 3

4. In the above I have not included the expenses of the Circular Canal, the orders upon which were received separately, and subsequently to the instructions upon the scheme for Mofussil operations. I shall therefore proceed to remark upon these several works in the first instance, reserving the Circular Canal for a separate consideration.

5. Upon the first item in the list, viz. Dredging operations, I have to remark, that the expenses incurred have fallen within the estimate; chiefly from the last constructed machinery working with greater economy than the first constructed. The expense in wear and tear of iron buckets and links, as also in the constant repairs and caulking of the eight mud lighters, which are of native construction and material, is however still very great, amounting to an average of 20 to 25 per cent. upon the other expenses.

6. For the chief part of the season, the new machinery, the strongest and best adapted for excavating in the hard ground, was kept at work, without the limits of the Canal in the upper Lake Channel in the neighbourhood of the first Chokey. The bed of this Channel does not partake of the nature of that within the mouth of the Canal, but is of a more consistent and stiffer composition. It appears generally to be an iron-colored yellow clay, with great admixture of shelly debris, whereas the bottom within the Canal, and in most of the stagnant parts of the Lake, consists of a black mass of soft silt, slime, and rubbish. In the Lake this rubbish is formed of vegetable matter from the decayed reeds and aquatic mosses which prevail. In the Canal the rubbish is chiefly that brought from the city Drains and crowd of Boats plying along its course, which finds no exit on account of the stagnation of this Canal.

7. The hard bed in which the new machinery usually excavated, does not yield so readily to the edge of the iron buckets, and its daily quantum of work performed on this account seldom exceeded five boats *lowly* in place of the usual quantity of six.

8. There is however this difference in the work performed in this hard bed, that whereas in the soft ground within the stagnant Canal, there is a constant filling in from the soft mud of the sides, besides the continued silting and deposit of rubbish, which does not allow the whole amount of excavation to have its beneficial effect on the navigability of the Canal, every inch excavated in this harder bottom, over which a tolerably strong current runs during one-half to low ebb in the dry months, is a positive gain to the depth of the Channel.

9. The excavations of the season have had an evident effect in improving the navigation of the Canal, bringing the bed to within one foot of the level, to which the inner Canal was deepened in the year 1826-27, while the deposit in that part has nearly raised it already to a par with the part dredged.*

10. I cannot however yet recommend it to the Committee to discontinue the dredging until another season has past; indeed I believe it will be advisable to continue until some little time after the opening of the new Circular Canal has had its effect in remedying the present stagnation of tide in this Canal, when I have no doubt of being able to place it on a par with the best parts of Tolly's Nulla in point of draft [*? draught*] of water for the Craft which usually frequent these passages.

11. On this part of the general scheme of Canals, I have as yet proposed nothing as a substitute for the Lake tracking paths, proposed and commenced by my predecessor, but abandoned after the first year as expensive and perhaps impracticable.† If the Committee deem it advisable to recommend the resumption of this work which my experience on the last mile of the Bhaminghatta Canal teaches me to be perfectly feasible, I am ready to submit a statement of the method and expense of constructing an embankment along the South bank of the Lake Channel, where it is chiefly required, with Bridged opening, to allow a perfect freedom of tide—which embankment will perfectly answer the purpose of a tracking path.

12. In my Scheme for the approaching season I have inserted the bare expenses of the two Dredging Machines at an Estimate of 600 Rs. per month, on the impression, that the Committee may deem it advisable to defer all subsidiary objects of the kind, as also the widening and strengthening different parts of the present Eastern Canal until the new Circular Canal is in a more forward state, and such works become more immediately necessary.

13. The Second item of the Scheme of Mofussil operations, Bahminghatta Canal is divided in my accounts and abstracts into two heads, the Canal from Ghoonamagee to Kantatulla and that from Kantatulla to Bahminghatta.

14. With respect to the first part from Ghoonamagee to Kantatulla, the inclemency of the month of June of the present year, alone prevented me from finishing it, and there will still remain a small quantity equal, including the two mouths, to about 500 Chowkas to excavate during the approaching year.

15. The excavation of this year have been entirely successful, and universally to the requisite depth of 12 to 14 feet. In no instance have I been arrested by any occurrence of oozing sand, and in one instance alone has there occurred any sliding of the banks. The last 6,000 feet of this part of the Canal which form the chief part of the excavations of the season lie through jungul, with roots to remove and embankments to keep up, besides

* Particularly in the vicinity of the principal bazar at Kood Ghat, where the sediment has been at least 18 inches.

† The reason here assigned is not correct—see Appendix 11, page 16, para. 33-34, page 29, para. 18, page 58, para. 4 and 5.—J. M.

some other contingent expenses to which such works are always subject, the actual gross charge per Chowka of 729 cub. feet has therefore rather exceeded the former average upon this and the Chultabarea Canal, and brings the year's average per mile upon this work to the full amount 10,000 Rupees,

	R.	A.	P.
Chaltabarea 1826-27, rate. ..	1	12	5
Bahminghatta 1827-28, ..	1	12	4½
This year,	1	14	10

exclusive of the expenses of last year in cleaning the jungul and embanking.

16. With respect to the latter division of this Canal from Kantatulla to Bahminghatta. In laying out the line and cleansing it of jungul and reed, it was found that the ground to be excavated was even more unfavorable than I had anticipated; and though merely skirting, as described in my former and present Sketch, the western Lake, a number of its shallow outlets had to be traversed, and the greatest part of the ground proved soft to a great depth, and consequently difficult to inclose by embankment, and lay dry for excavation.

17. This circumstance and the unfavorable locality of Bahminghatta for the residence of any great number of Coolies, induced me early in the season to abandon the hope of completing the whole, and I restricted myself to the portion C. D. marked in the Sketch, which I have the satisfaction to say is completed to a depth throughout of 11 or 12 feet below high water; and now open to the tides, which flow through it into, and out of the Lake with same force.

18. The expenses upon this Canal, of which only 2,800 running feet have been actually finished, have been great on account of the nature of the work. I enclose a Sketch of the ground to explain the remarks which I conceive it my duty to offer on the subject.

19. It will be seen, that in the first instance a clearance and walking bund of upwards of half a mile necessary along the Koorool Khal, with three temporary Bridges and a Ferry, in order to conduct the laborers to the ground. The clearance and enclosure had then not proceeded 800 feet before it was intersected by the first considerable Lake outlet, beyond this point the ground gradually became worse, crossing in all, five other Lake outlets, which had to be bunded on both sides up to the Central Nulla at D. where the excavations of the year ceased at a point beyond the softest part of the line.

20. To embank along this line was a work of much labor time, and difficulty. The surface being all soft mud to a depth of 3 feet, it became necessary to remove most of it to procure good stuff for an embankment, which, when formed, sunk constantly and required to be frequently raised, until by constant drying and caking a tolerably firm structure was created.

21. It may easily be imagined that the expense and delay of such kind of work, the additional measures necessary to keep the laborers from desertion and ensure success, would make the Superintendent cautious in not attempting more than he could depend upon finishing. I enclosed a length C. D. proportioned to the number of hands that the two first months led me to reckon upon, which is completed to the full depth; besides which, I have employed such Coolies as declined Chowka cutting, in finishing the South bund of enclosure for the remainder of the line, and clearing the South bank of the Nulla E. F. which, when widened, will form a part of the Canal.

22. The manner in which this Canal is laid out by closing all outlets to the south and opening those to the north, and thus making the Canal the feeder and outlet for the Lake, will secure the success of this Canal in preserving its depth.

23. The remaining portion D. E. runs through more favorable ground than that already passed, and the expense will be less on account of the numerous preparatory operations which have already been made. The expense of the whole line from Kantatulla to Bahminghatta will be little above 16,000 Rs. the distance being two miles, and the excavations 1½, inclusive of the Nulla to be widened.

24. The total estimate of Rs. 72,000 for the entire Bahminghatta Canal will therefore more than cover the actual expense which is likely to be incurred.

25. The works under the next head, Bhowaneepore Canal, with some few trifling bunds, left to clear when the waters subside next year, have been brought to a close, and the Canal opened to passengers.

26. The line pointed out in my former Sketch of the ground and inserted in the General plan of this year has been strictly followed, and I have the satisfaction to report, that across the highest parts of the two spits of sand, formerly noticed as intersecting the Canal, the excavations have been carried to 8 feet below high spring water mark.

27. This Canal, although similar to the Bayleygunj Canal in the circumstance of uniting two tideways, offers even more chance of success over that Canal than I had formerly stated. It appears by my observations when the Canal was opened in May, June, that there is a difference of nearly one hour between the first ebb in the two Khals at the two ends, which is likely to induce a set from the Gobra to the Hinshce Khal during ebb tide, which, with the help of the back water in the Bhowaneepore Jheel when opened and the old Nullah at F. will effectually prevent any considerable stagnation and consequent sediment.

28. The works upon the two Canals of Hoseinabad and Bayleygunj have been limited to the deepening of the mouth of the former, opened late in the season preceding, and the expenses under this head have therefore been proportionally trifling, amounting to Rs. 159:15:1.

29. Upon the Bayleygunj Canal I have thought it advisable to incur no expense during the year, partly lest it should interfere with the progress of the Bhowaneepore Canal and chiefly because I cannot now see much improvement that can be expected from such trifling outlay upon this Canal.

30. The defects of this Canal are, I believe already fully known by the Committee. The sandy ridge in the centre, where unfortunately the tides meet, has filled by silting to 3 and $3\frac{1}{2}$ below high water mark, although excavated to 6 and 7. The chief part of this Canal, and particularly the Southern division, was left incomplete and irregular, in some places excavated not more than 3 feet. In 1826-27 I expended with the sanction of the Committee a sum of Rs. 2,052:14:9 in finishing these uneven parts to an even bottom, 5 feet below high water mark, and hoped that much would be gained when the Kullooar Bund should create an uniformity in the set of tide.

31. I have already stated that the observed tide in the Gobra and Kullooar Khals has an extreme rise and fall of 11 feet, and as there is no possibility of shutting out one tide, there remains no method of making this Canal an useful tide-passage, but by again shutting up the two ends and excavating it to low water mark or near that level. The defect of silting will still remain to this Canal, as I cannot devise any means within reasonable limits of expense to provide a head of water in the centre. Still if the two ends are sufficient in depth to allow boats to pass at half tide, and the silting is confined to the centre, any constant expense to preserve a passage that may hereafter be thought necessary will be greatly diminished, besides the improvement to the Canal as it exists at present, which must take place by such measure.

32. Whether therefore under these circumstances the Committee will see any advantage in recommending any thing to be done for the improvement of the Bayleygunj Canal, which at present forms the chief bar to the utility of the new series of cuts between Hoseinabad on the Eeshamuttee and the Salt Lakes during the approaching season, or otherwise defer it to some future period, I conceive it my duty to state what I suppose will be the result of such measure, and what the expense necessary for the purpose.

33. In its present state, the Canal is only available at high water (or for 2 hours of each tide of 12 hours) for Boats drawing 3 to $3\frac{1}{2}$ feet water. When excavated to low water mark, (and perhaps 8 feet below high water in the centre beyond which is oozing sand) the passage will be available to Boats of 7 feet draft as a tide-passage, the silting will not be so rapid and general in the Canal, although far from being altogether obviated. The expense of the excavation of an additional 5 feet average will amount to 8 or 9,000 Rupees at the least.

34. Upon the last head of the above Scheme, Balyaghat Road Drains, I have incurred only the trifling expense of Rs. 90 : 7 : 5 upon five Cross Drains.

35. I trust that the Committee will not, on mature consideration, think fit to report otherwise than favorably of the general progress of the works above enumerated in their communications with the Governor General in Council.

36. The expenses have been at what must be looked upon as a moderate rate, considering all things. The balances left outstanding upon these works, all of which proceed upon contracts with advances, and could not be managed otherwise with economy, have decreased in proportion to the amount of outlay each succeeding year of my Superintendence, and although much delay and some litigation occurs in recovering these sums, I hope to be able in the end to recover the whole.

37. The ill success attending the suit against the defaulters of 1823-24 has, I cannot hesitate to say, created a feeling among the contractors usually employed on such works, which has originated most of that reluctance to settle their accounts without legal proceedings, which I have experienced, and this belief of their impunity, which has prevailed, is likely, I fear, as long as it lasts, ever to stand in my way in the Mofussil works. I am happy however to state, that whatever legal measures have been resorted to at different times for the recovery of balances, have been with very few exceptions, successful. I attach to this report a statement of the balances incurred and their present state, from the year 1826-27 to the present moment.

38. I shall now proceed to remark upon the several objects, which should occupy my establishment during the approaching season.

39. To assist in the general view, I have forwarded an outline Map of the whole line between the Eeshamuttee River and Hooghly River at Calcutta, on the scale of 2 inches to one mile.

40. The only point of the projected Cuts along the whole extent, whereas yet no commencement has been made, is that Cut of $1\frac{1}{2}$ mile formerly denoted by the letters X. Y. of my former Sketches, between the Hinshee and Bairmarce Khals. This Cut X. Y. formed a part of the series of Cuts proposed by Major Schalch in 1823-24. Upon a survey of my own, to replace the original straight line of 10 miles from Hosseinabad to Bassera, which was sanctioned upon the plans originally submitted by Major S., and as I deferred its execution, I have not hitherto proposed any deviation from it.

41. The whole of the line X. Y. is remote from the cultivated Country ; and my experience of the difficulty, expense, and uncertainty of work so situated, leads me at once to prefer another route which I have marked on the accompanying general outline plan. I have the honor to recommend it to the consideration of the Committee. The distance by the two routes varies scarce half a mile. The Khal which is followed although somewhat tortuous, is sufficient in depth and section, and the line of excavation necessary is reduced from $1\frac{1}{2}$ to less than 1 mile, besides being through the cleared of Chaitil. The line X. Y. could not certainly be excavated at a less expense than Rs. 25,000,—while the new proposed route may be opened at 10,000

42. I have inserted this proposed Cut in the Schedule for the approaching season. Should however the Committee still wish to defer it on the ground that a route still exists by the Akratulla and Bairmarree Khals, to connect the Bhowanceepore Canal with Bassera, the item may be struck from the Estimate.

43. The several points where the works remain unfinished are Bahminghatta and Bayleygunj, upon both which I have already submitted my remarks.

44. Besides the several Canals above alluded to in the series, it was, I believe, contemplated to form a clearance and tracking-path along the banks of the several natural passages which were to be taken into the route.

45. Upon this point I have as yet submitted no specific proposition to the Committee, nor have I proposed any measures for clearing away the various trees and sunken roots which obstruct parts of the passage, more especially in the Hinshee, Gobra, and Dairsai Khals. I have ever considered these points as secondary, and such as might proceed even after the trade is attracted into the new route. I am ready however, whenever the Committee think it advisable, to commence these several objects.

46. My Schedule for the approaching season is therefore as follows :

1. Dredging operations at 600 per month,	7,200	0	0
2. Bahminghatta—			
Jheel Canal, 2,300 feet, and 1,760 feet of Nullah to widen, ...	7,000	0	0
Ditto 500 Chowkas to complete, and opening of two ends E. of			
Kantatulla,	1,000	0	0
3. Chaitil Canal, one mile, if approved,	10,000	0	0
4. Deepening Bayleygunj Canal, average 5 feet, if approved,	8,000	0	0
<hr/>			
Total Estimate,	33,200	0	0

47. In the above Scheme I have still limited myself to the parts of the Scheme of Canals West of the Eeshamuttee. It has hitherto been thought expedient to wait the result of the opening of this series of Cuts to the West of the River named before the works farther Eastward are attempted ; among the several Canals proposed beyond this River there are some of inconsiderable length, which, from their position, cannot be of doubtful result. Such for instance as the isolated Canals proposed at Bytaghatta, Bungurreea, and Narroolee, while the more extensive one at Sreepoor remains still for farther investigation.

48. The three Canals of Bytaghatta, Bungurreea, and Narroolee may, if judged proper by the Governor General in Council, at the recommendation of the Committee, be undertaken immediately, and with advantage to the general navigation of the Soonderbuns. I shall however, I fear, experience some little inconvenience without a covenanted assistant, in superintending Works at such a distance as 3 to 4 days' journey, while the Circular Canal Works, and the Flood Gates and Bridges, require such constant attention.

49. I shall now proceed to report upon the progress made upon the New Circular Canal up to the present moment, with some observations upon the expected period of its final completion, and the proceedings of the approaching season.

50. The instructions of the Committee allowing me to commence upon the New Circular Canal were received only late in January last, and my proceeding upon this work therefore can only date from February. The season however has proved remarkably favorable, and I have completed more of the excavations than I had at first anticipated.

51. The whole length of this Canal, including Basin and opening towards the River, will be between 19,000 and 20,000 running feet. Up to the first August the excavations had been finished and brought to account upon 105 lots, containing 23,739 $\frac{3}{4}$ Chowkas, of 729 Cubic feet, and comprising a length of 10,526 running feet, besides that a considerable progress had been made upon 7 or 8 other lots, 100 feet each ; these excavations extend as exhi-

bited in the general outline plan hereby forwarded, from the letter G. in Scaldah to the Dum-Dum Road at C., with interruptions at two points E. and F., where two Bridges of Suspension are constructing, and again at D. where the property of Kour Hurrinauth,* not yet purchased by the Committee, interfered with the line.

52. Since the 1st August, 32 lots have been opened and nearly finished to a depth of 6 feet between Scaldah and the Eastern Canal; also 24 lots between the Dum-Dum Road and the site of the proposed Flood Gates at Chitpore have been commenced, and some progress made as far as the arrangements for the ground have allowed.

53. The estimated number of Chowkas for the whole Canal amount to somewhat less than 50,000 Chowkas, so that I may safely say, that I have already completed upwards of one-half of the excavations, inasmuch as up to the present moment the number of Chowkas brought to account is 24,603, while those excavated and yet unmeasured cannot fall far short of 3,000.

54. Besides the above work, the foundations of two Bridges, viz. the Manicktulla Road at E. and Ramloehun's Road at F., have been carried to a height of 3 feet above the tracking-path, as shown in the design formerly forwarded to the Committee, and a sufficiency of bricks made at the intersection of the Sambazar and Dum-Dum Roads for a third Bridge.

55. With respect to the method pursued in conducting the work, I have, as hitherto, preferred contracts for small portions of 100 feet each in length, with this difference however in the mode of proceeding, that instead of giving advances generally equal to one-fourth or one-third the expected cost of the work, I have succeeded in avoiding any advances in the first instance, paying to the contractors from time to time small sums to allow them to retain and feed their Coolies, proportioned only to the work already executed at the time of each payment.

56. The inconvenience of outstanding balances is thus entirely obviated, and hitherto I am happy to say, that every settlement of accounts with the contractors employed has exhibited a balance in their favor; nor has this change of system in any way fettered the progress of the work, and I have only to regret that local circumstances prevent my instituting the same arrangement with the Mofussil operations.

57. The whole of the works in the two Divisions, D. E. and E. F., were filled with water during the night of the 27th June last, when the unusual quantity of rain† which fell during that and the preceding days had the effect of flooding the Roads and Villages adjoining. The inundation in breaking over the Roads into the Bridge excavations destroyed the side Drains which had been provided to carry off the rain water from the Town, from thence as well as over the Road it entered the Canal excavations, which were filled in the course of a few hours up to a level with the side Roads.

58. The excavations in the Division E. F. were at the time entirely completed, and there remained only one lot in the Division D. E. unfinished, the excavation of which may be easily resumed when the waters have been drained down to the level of the Eastern Canal during October and November next, so that no material inconvenience is likely to arise from this inundation.

59. The work on the two Bridge foundations suffered more material inconvenience, and some additional expense was incurred.

60. In July new side Drains were provided, the Roads repaired, the connection of the Bridge excavations with the Canal cut off, and water pumped from the foundation. The work was again resumed before August without further inconvenience, and is now only somewhat delayed by the state of the Roads, which are unfavorable for the speedy transport of materials.

† The rain which fell on the 27th June is quoted in the Register published by the Surveyor General at $6\frac{2}{10}$ in.

61. In my design and observations relative to this Canal, submitted in October 1827. I stated my expectation, founded on the different wells which I had sunk for the purpose of ascertaining the nature of the soil, that the depth proposed for the excavation upon my improved plan would scarcely touch upon the stratum of oozing sand at any part.

62. My hopes have so far been realized that in two cases only has any inconvenience at all been experienced from either this sand or from springs of water, in neither case of any consequence.

63. At the Bridge at F. at the intersection of Ramlochan's Roads, the foundations have been carried about 3 feet into the sand, and in the adjoining five lots, the excavations have been carried a foot into the stratum of sand. These numbers, being the first excavated, some delay was occasioned by the great accumulation of water. The finishing of the remaining numbers, between these and the Bridge at E., in which no sand was reached, allowed me the means of Draining off this water, and indeed laying the stratum of sand so far dry as to allow of the Bridge excavations being carried without difficulty to the requisite depth of $2\frac{1}{2}$ feet below the bottom of the Canal.

64. The Manicktulla Bridge foundations do not touch upon the stratum of sand which I believe to be 2 or 3 feet below the masonry. In the adjoining numbers towards the North, however, great inconvenience was experienced from the quantity of water which came into the last three feet of the excavations—a large body of water in a tank adjoining may have been one chief cause of this, as generally no sand came out of the excavation.

65. The gross charge per Chowka of 729 feet, inclusive of all expenses of establishment and contingencies, and some that were not anticipated in the estimate, such as grassing the slopes, levelling the side Roads, and piling many parts where soft bed of old tanks or new mud threatened to slide into the bed of the Canal, has been up to the 1st August Rs 2:3:0, which may be considered a very moderate average, where the third Chowka or beyond 18 feet has been reached. The contract rates for the different depths of 9 to 18 feet and 18 to 27 feet have been much as usual—being for the first Chowka Rs. 1:6:0 to the depth of 9 feet: 2/0 for the second to the depth 18 feet, and 2/12 for the third to the depth of 27 feet.

66. It now remains for me to offer my remarks upon the work remaining for the approaching season, which will, I hope, very nearly complete the excavations, leaving only the mouth to open during the following year, with perhaps some works connected with the system of Flood-Gates and the different Bridges and Roads.

67. The three remaining Bridges will be commenced early in the season; I have already proposed to the Committee, on account of the extensive thoroughfares, to construct two of these Bridges, viz. those on the Barrackpore and Dum-Dum Road, on a different Plan, with a double Road-way. I have now the pleasure to forward an outline design for the masonry which is only increased in solid content, by the alteration, to the amount of 8,000 cubic feet. Captain Baker will be ready to state the difference of expense in iron-work and road-way.

68. It is also my intention to commence at an early period upon the foundations of the system of Tide-Gates near the Chitpore Bridge.

69. In the Plan now before the Committee under the sanction of Government, I had assigned a position to these Gates purposely a little removed from the line of the present Road, in order that the progress of the work might not interfere with the existing thoroughfare which is very extensive—as also to give the approaches to the Bridges across the Tide-Gates a more direct course than the present Road could afford, which is very oblique. I have the pleasure to forward a Sketch surveyed by H. Turner at my request, exhibiting the different properties which will be required for a Road of approach to the works when

See Nos. 54, and 55, of Appendix to Appendix (H).—J. M.

placed in the most convenient site. I have made the line interfere as little as possible with valuable buildings, and I have to recommend it for adoption in preference to any interference with the present Road until the work is complete.

*† These designs
Plans in origi-
d, are lodged in
e Office of the
ilitary Board.—
M.

70. In the design* for the Tide-Gate already with the Committee, there are to each opening two gates only—one pointing land-wards the other River-wards. As however it appeared, from several opinions which were procured by the Committee from professional persons, that a third Gate to each opening was generally considered as offering more security and advantage than would compensate for the additional expense, I have thought it incumbent upon me to prepare a Plan† with such addition, according to which Plan I am also preparing a working model upon a scale of half an inch to a foot.

71. The additional expense in solid masonry alone will be about 5,000 Rs., on account of the extension of the pier and abutments to allow of a chamber for Boats of 50 feet clear. Hatches will be necessary to both the large Gates pointing towards the River, with crabs or gear to work the Gates. So that the additional expense above the former estimate of 60,000 Rupees will not much exceed 10,000 Rupees.

72. I have no hesitation to say that the additional pair of Gates will afford greater security against any failure or irruption of the River into the Canal in its highest state.

73. The Flood-Gates, or those pointing towards the River, will probably not be used at all between the 1st November and 1st of March, or last Springs of February. They will be used only during the Spring Tides of October, March, April and May, and I conceive that the double Flood-Gates, as a lock, will be used only on occasions of emergency during the remaining four months, June, July, August, and September.

74. In the design now forwarded, I have also inserted a Draw-Bridge of double flaps, in place of the standing wooden Bridges of the former design—the objections which induced the Governor General in Council to disapprove of the application of this kind of Bridge to the other parts of the Canal, cannot of course bear with the same force upon the present case: a Bridge on the Suspension principle would manifestly be totally out of character with the rest of the present structure, besides that its cost would be greater, and the choice appears to rest entirely between a fixed Bridge of timber or iron—a revolving Bridge, such as are used over Canals and Docks in England, of iron or timber, and a Draw-Bridge on some similar construction to that exhibited in the accompanying Plan.

75. Upon the several subjects on which I have now brought forward specific propositions relating to the Circular Canal, I have to request an early consideration; as I am prepared to proceed upon the works without further loss of time; having made all arrangements, and already received from Benares the Chunar Stones necessary for the Gate sills.

76. I have further to remark, that I believe the Committee are already aware how straitened for room to receive the earth of excavation, I shall probably find myself between the Barrackpore Road and Chitpore, in which part of the work the width has to be extended for forming the basin and the ground itself is naturally high. I have staked out the Canal at the width of 180 feet,‡ which with 30 feet of Road on each side, will allow from the quantity purchased only 80 feet on each bank to contain the earth.

§ My design sta-
200.

77. The subject has already been brought before the Committee in my application for certain Tanks that lie adjacent, all which it is highly necessary should be rendered available. It would also be highly beneficial if any arrangement could be made with the neighbouring proprietors for lease on emergency to fling some of the earth on their grounds.

78. I have also to request the permission of the Committee to fill up the old Mahratta Ditch, which will provide for a considerable quantity of the earth—I conclude there can be no objection to this measure, for its present use is chiefly as a boundary, which will be just as well provided by a mound formed from the earth of excavations as by a drain.

See Nos. 663,
a, 665, 667, and
a, of Appendix
Appendix (H).
M.

79. In adverting to the mound formed from the earth of excavation, it will not perhaps be thought irrelevant in me to suggest a method for future consideration of gradually removing or at least diminishing its bulk. Its presence is certainly both unsightly and inconvenient, and may, in all probability, interfere greatly with the advantageous resale of the ground upon which some reimbursement is expected for the outlay upon the work.

80. I shall require during the approaching year for the works of the Canal alone, a quantity of bricks equal to 30 lacks, all which it is my intention to derive entirely from this earth. It occurs to me that the position of the Canal will be in every way convenient for a brick manufactory for Government, and even general purposes of the market, and that in this manner, with proper direction, convenient sites may be cleared for bazars and wharfs in the first instance, and in time further clearances be made along the whole ground until it is reduced to a state in which its sale would not be prejudiced by the position of the earth of excavation.

81. The suggestion is not perhaps unworthy of serious consideration, and I shall be happy, if by my own exertions, I can in any way conduce to so desirable an object, by either myself superintending any measure of the kind, or undertaking it on the part of Government as a brick manufacture for the first year, instead of the usual method of dealing with Native contractors, who always deliver inferior bricks.

82. I have not during the season drawn to the full amount of the assignment granted upon account of the Circular Canal, as will be seen in my accounts. The whole expences of the Canal have been sanctioned at an estimate of about 3 lacks, inclusive of Iron Bridges. For the expenses of the approaching season, in addition to the balance still lying in the Treasury, it will, I expect, be sufficient if another assignment to the same amount of one lack be placed at the disposal of the Committee. If, however, I should find in the progress of the works that farther funds are necessary, it will be always in my power to make timely application.

83. Having now submitted my remarks upon the different works of the season, I have to hope they will prove satisfactory. The Committee are, I believe, aware of the superior importance which I have ever attached to the Circular Canal among the various other objects of the General Scheme, for improving the navigation of the Sunderbuns which is in progress, and my consequent anxiety to complete it at the earliest period. I should not however wish it to be supposed, that it is in any way my desire to do this at any sacrifice to other objects, and if the Committee are of opinion, that the Schedule herein submitted for Mofussil operations is too inconsiderable, which, reference to the final completion of the whole series of works, and to the scale of the Government Canal Establishment, I shall be most ready to extend it, which may be done without difficulty, by the help of some covenanted or uncovenanted assistant to reside either in Calcutta or to be deputed on the Mofussil Canals.

84. I have hitherto, as the Committee know, had no European assistance beyond that occasionally of a mechanic to assist in constructing machinery and other works of like nature. The services of this class of people are, in general, worse than useless in this country, in most objects beyond those connected with their own particular trade—and it is difficult to find one who will, from his general character and sobriety, give satisfaction even on these particular duties. The European now in my establishment has gradually declined into habits that make his services little adequate to the salary received, and as some person of the same trade will be almost indispensable during the approaching year, I shall, if the Committee see no objection, endeavour to supply his place, by taking such men as offer in the first instance only on trial. In the meantime, I have already given Mr. Charles Aiston warning of his discharge.

85. As therefore I cannot depend upon the European employed on my Establishment upon those particular objects, such as the construction of the Gates and Bridges, and every thing connected more immediately with the work-shop, for any thing like a general and useful Overseer—in case it is judged proper to extend the Plan of operations beyond the Eeshamuttee. I shall be obliged to search for an Assistant from a different class of persons more competent to act on detached duties.

86. This will however depend entirely upon the decision of the Governor General in Council upon the scale of operations for the season.

CALCUTTA, (Signed) THOS. PRINSEP, *Capt. Engineers,*
SUPERINTENDENT OF CANAL'S OFFICE: *Superintendent of Canals.*
The 19th September, 1829.

(True Copy.)

J. N. JACKSON,
Member, performing the duty of Secretary, Canal Committee.

No. 119.

No. 96.

TO CAPTAIN THOS. PRINSEP,
Superintendent of Canals.

SIR,

With reference to the 74th Paragraph of your Letter of the last season 1828-29, dated the 19th ultimo, relative to Bridges, I am directed by the Canal Committee to request you will furnish me with the least possible delay, separate minutely particular Estimates of the three descriptions of Bridges adverted to in their document above referred, to enable the Committee to judge of the comparative cost of each.

CANAL COMMITTEE'S OFFICE, (Signed) J. N. JACKSON,
CALCUTTA: *Member, performing the duty of Secretary.*
The 14th October, 1829.

I have, &c.

No. 120.

No. 197.

TO MAJOR J. N. JACKSON,
Member of and Officiating Secretary to the Canal Committee.

SIR,

In reply to your Letter of yesterday's date, I have the honor to state, that it is not in my power to furnish immediately, as required in your Letter, separate minutely particular Estimates of all the three descriptions of Bridges alluded to in the Report. But of the two descriptions of Bridges, of which Plans* are already before the Committee, viz. standing Bridges of timber over both openings, or a standing Bridge over one opening, and a Draw-bridge over the second opening, I have already forwarded a particular Estimate of

* The original Plans here referred to are lodged in the Office of the Military Board.—J. M.

the first, included in the general Estimate for the Tide-gates, amounting to Sa. Rs. 3,383, and its proportion of Contingencies say 338 Rs., in all 3,721.

For Standing-Bridge over one opening as per former Estimate, ... 1,860 8 0

Two Draw Flaps

Each of five trusses with standing piece included, containing 49

running feet of Timber @ /12 per foot, ... 36 12 0

Heavy cramps with screw bolts about one maund, ... 16 0 0

For the five @ 52 12 0 263 12 0

Planking with rafters for 180 square feet @ /12 per foot, ... 135 0 0

Two uprights of Timber strutted, ... 60 0 0

Two levers with cross timber, ... 50 0 0

Iron tie to do., weighing $1\frac{1}{2}$ maund, ... 30 0 0

80 0 0

Iron work to each flap in suspending and rail chains, hinges, or

pullies to flaps and lever bolts, &c. estimated to weigh 30

maunds, inclusive @ 20 Rs. per maund, ... 600 0 0

Per each flap, ... 1,138 12 0

For entire Bridge, ... 4,138 0 0

This charge is exclusive of masonry which has been provided for in the Estimate for the whole structure, and will not undergo any material alteration by the change in the form of the Bridge.

With regard to the other Bridges alluded to, viz. Standing-Bridges of iron or revolving Bridges of iron or timber, it will require some little time to prepare drawings and consult with the persons connected with the home iron founders before any exact or even approximate Estimate of their cost can be furnished.

The revolving-Bridge if prepared will require a considerable alteration in the masonry from the space it will require in which to work, and it is evidently the construction of all others most costly, although generally preferred at home as more perfect in general advantages. I cannot suppose that a Bridge of this description of cast iron could be imported and erected at less cost than 10,000, and may cost much more.

If the Committee should see any reason to recommend this latter construction in preference, I will at a future period forward descriptions and Estimates of such Bridges in timber, and cast or wrought iron, with the corresponding alterations which will be necessary in the masonry of the pier and abutments.

I have, &c.

CALCUTTA,
SUPERINTENDENT CANAL'S OFFICE:
15th October, 1829.

(Signed)

THOS. PRINSEP, Capt. Engineers,
Superintendent of Canals.

No. 121.

No. 99.

To CAPTAIN T. PRINSEP,
Superintendent of Canals.

SIR,

Adverting to the suggestion by you in the 11th Paragraph of your Report, as to the construction of Tracking-paths on the Bank of the Channel of the Salt Water Lake, the Canal Committee request you will have the goodness to favor them at your earliest convenience, with the statement* of the method and expenses of constructing the Embankment, as proposed by you.

CANAL COMMITTEE'S OFFICE,
CALCUTTA :
16th October, 1829.

I have, &c.
(Signed) J. N. JACKSON,
Member, performing the duty of Secretary.

(No. 122. omitted.)

No. 123.

No. 111.

To E. MOLONY, ESQ
Deputy Secretary to Government.

Territorial Department.

SIR,

I am directed by the Canal Committee to forward herewith for submission to Government, the Copy of Captain Prinsep's Annual Report of his Proceedings as Superintendent of Canals during the past season, with the whole of the Plans in Original that accompanied it.

2. The Committee are persuaded that Government will not fail to peruse with satisfaction this very able Statement, but they are particularly desirous to call the attention of His Lordship in Council to the satisfactory results of the operations of the past season, and to the circumstance that Captain Prinsep's expences during the year have not exceeded the authorized Estimates.

3. The Committee do not consider it necessary to occupy the attention of Government by following Captain Prinsep's Report, paragraph by paragraph, but will confine themselves to the notice of such particulars as appear most prominently to require remark.

4. With regard to the system of Dredging adverted to by Captain Prinsep in the 10th Paragraph of his Report, the Committee do not at present see any objection to its adoption for the period specified, indeed it may ultimately prove desirable to continue it beyond that time.

5. The Scheme alluded to by Captain Prinsep in the 11th Paragraph of his Report as a substitute for the Lake Tracking-paths through the Channel of the Salt Water Lake, appears to the Committee deserving of further enquiry ; they have accordingly called† upon

*† No answer appears to have been given by Capt. Prinsep to the application of the Committee here referred to, but about this period Capt. Prinsep met his death by a fall from his horse. The Records of the Canal Committee have been traced up to April 1830.—J. M.

Captain Prinsep to furnish them with a Statement of the probable expense of the undertaking, and of his contemplated mode of procedure for the purpose of securing its effectual accomplishment, and which shall hereafter be forwarded for the consideration of Government.

6th. In regard to the operations suggested by Captain Prinsep to be carried into effect during the ensuing season in the Mofussil, the Committee are decidedly of opinion that, it will be highly expedient to confine them to the completion of the Channels now in progress, with the exception of the Bayley Gunj and Kulloar Khal passages, and to the excavation of the new cut proposed by Captain Prinsep through the cleared country of Chitil of the former line X. Y., by which a saving of 10,000 Rupees is likely to be effected.

7th The Schedule of Mofussil Expenses will therefore stand as follows :—

1st. Dredging operations at 600 Rs. per month,	...	...	7,200	0	0
2nd. Bahminghatta.—Jheel Canal 2,300 feet, and 1,760 feet					
Nullah to widen,	...	...	7,000	0	0
Ditto 500 Chowkas to complete, and opening of two ends E.					
of Kantatulla,	...	...	1,000	0	0
3rd. Chitil Canal 1 Mile,	...	...	10,000	0	0
Total Sa. Rs.,			25,200	0	0

8th. The measures pursued by Captain Prinsep for the realization of Outstanding Balances, are regarded by the Committee as judicious, and the amount* recovered affords a most satisfactory proof that Captain Prinsep's measures were prudently adopted.

* Sa. R. 4,179. 14. 1

9th. The early completion of the new Circular Canal is, in the judgment of the Committee, in every point of view, peculiarly desirable, and they are of opinion, that Captain Prinsep has effected as much as it was possible for him to accomplish under the difficulties which have arisen to retard the Committee's operations in effecting the purchases of the lands required throughout the whole line.

10th. With reference to the operations proposed by Captain Prinsep in the 68th and 69th Paragraphs, the Committee remark, that they involve a considerable departure from the Original plan, and must materially increase the expence beyond the Estimates, although therefore they admit that the site now proposed for the Bridges is an improvement, and they observe that part of the expence might be covered by the Sale of the Land forming the present Road ; they are not exactly prepared to recommend the adoption of the alteration. They conceive it belongs more particularly to Government to determine whether it is advisable to expend the sum required for the improvement contemplated in the appearance and convenience of the work. Should the alteration be disapproved, they are of opinion, that it will not be difficult to devise some method of preventing the apprehended interruption of the thoroughfare.

11th. The design of Flood-Gates adverted to by Captain Prinsep, in the 70th, 71st, 72nd and 73rd Paragraphs of his Report, having already been submitted to the investigation of the most competent and scientific judges and approved of by them, the Committee are of opinion, it should be adopted.

12th. The Plan of a Draw-Bridge to be erected across the Tide-Gates, suggested by Captain Prinsep in his 74th Paragraph, is similar to that formerly submitted to the consideration of Government, and although His Lordship in Council was pleased to disapprove of the general adoption of Bridges constructed on the principle, yet as it would appear from a reference made to Captain Prinsep that its cost will be only 3,721 Rupees, and as it is obvious that a Bridge on the Suspension principle would be out of character in such a

situation, the Committee upon the whole feel disposed to recommend the adoption of a Draw-Bridge in this particular instance.

13th. The Committee feel it their duty to bring to the special notice of Government the proposition submitted by Captain Prinsep in the 78th Paragraph of his Report, relative to the filling* up of the present Mahratta Ditch. This Ditch forms the legal and acknowledged boundary of the Jurisdiction of the Supreme Court, and although it may not appear of any material importance whether the boundary should be marked by a Ditch or an embankment, yet the Committee feel unwilling to disturb a line of demarcation so long established and recognised, without previously obtaining the express sanction of Government to such a measure.

14th. In Paragraph 80th and 81st Captain Prinsep suggests the establishment of a Brick manufacture in the vicinity of the line of the Canal. The Committee perceive no objection to the limited and immediate supply required by Captain Prinsep being prepared in the manner proposed from the earth already excavated, but they are of opinion, that any permanent Establishment of this nature would be looked upon as inconvenient and dangerous by the surrounding neighbourhood, and it might eventually interfere with the advantageous sale of surplus ground which the Committee anxiously hope to effect at a future period.

15th. The Committee have no hesitation in recommending a further assignment being made to the extent of one Lac (1,00,000) of Rupees for carrying on the operations connected with the Circular Canal, which can be increased as the progress of the work may render absolutely necessary, and timely notice of the same can be afforded to Government.

16th. The concluding Paragraphs of Captain Prinsep's Report require no particular notice, as the Committee have already suggested for the consideration of the Right Honourable the Governor General in Council the expediency of confining Captain Prinsep's operations during the approaching season chiefly to the works carrying on in the new Circular Canal, they however, could wish to be empowered by Government to authorize Captain Prinsep to entertain from time to time such mechanics as he can procure on reasonable rates of salary.

17th. The Committee request the Original plans forwarded herewith may be returned to them when no longer required.

CANAL COMMITTEE'S OFFICE,
CALCUTTA :
The 31st October, 1829.

I have the honor to be,
Sir,
Your most obedient Servant,
J. N. JACKSON,
Member, performing the duty of Secretary.

No. 124.

No. 1318.

TO THE SECRETARY TO THE CANAL COMMITTEE.

Miscellaneous Revenue.

SIR,

I am directed by the Governor General in Council to acknowledge the receipt of your Letter dated the 31st ultimo, submitting Captain Prinsep's Annual Report of his proceedings as Superintendent of Canals during the past season, and in reply to communicate as follows :—

* See further correspondence upon this subject in Appendix to Appendix (H) No. 54 and No. 55.—J. M.

2. The result of the operations carried on by Captain Prinsep during the past season, as particularly detailed in his Report, is considered by Government to be very satisfactory, and to do credit to the zeal and management of Captain Prinsep.

3. The details of the plan of operations proposed for the current season being approved generally. The Governor General in Council deems it sufficient to convey to you the orders of Government on those points only which appear to require particular notice.

4. His Lordship in Council is of opinion, that during the ensuing season the labours of Captain Prinsep should be confined to the works West of the Issamuttee,—and the Circular Canal being by far the most important of those works, his attention should be more particularly directed to its completion.

5. The Governor General in Council approves of the several works, specified in the 7th Paragraph of your Letter, being undertaken at the Estimated expense therein specified, and although the Committee have not included in the Estimate and in their recommendation the measures proposed by Captain Prinsep to be adopted for deepening, at an Expence of 8,000 Rs, the centre of the Bayley Gunj Canal. His Lordship in Council considers it to be very expedient that the excavation should be made as early as possible.

6. Treasury Orders will accordingly be issued in favour of the Committee to the extent of Rs. 33,200 for the works above adverted to, and of one Lac of Rupees for the Circular Canal.

7. The alterations proposed by Captain Prinsep in the sites of the new Bridges, and the improvement of the approaches to them, are considered by Government to be judicious, but before distinctly sanctioning the adoption of his propositions, the Governor General in Council desires that he may be required to state in how far they are calculated to increase the expense beyond the original Estimates.

8. The construction of the Flood-Gates and Draw-Bridges upon the plan proposed by Captain Prinsep is approved and authorized.

9. With regard to the proposed measure of filling up the Mahratta Ditch, the Governor General in Council is of opinion, that it is unobjectionable, and may be adopted. It must of course be a great object to clear the ground hereafter to be sold, as well as the space to be retained near the Canal, of the earth which may be excavated from the Canal and Basin. With the same view His Lordship in Council considers it expedient to sanction Captain Prinsep's proposition for making bricks to such an extent as may be practicable—care being of course taken that the manufactory be not carried to an extent which will either detract from the value of the surplus ground, or prove a nuisance to the neighbourhood.

10. The Governor General in Council authorizes the Committee to allow Captain Prinsep to entertain from time to time such Mechanics as he may be able to procure at moderate salaries, and if, as appears from his Report, the Mechanic now entertained by him, be incompetent, he should of course be discharged.

The plans which accompanied your Letter are herewith returned.

I am, &c.

[(Signed) E. MOLONY.]

Deputy Secretary to Government, Territorial Department.

Note.—Of the further papers of this Appendix deemed by the Municipal Committee necessary to be printed, the following (Nos. 51 a, 56, and 59,) have been omitted to be inserted in their fitting place.—J. M.

No. 51. a.

No. 1.

Estimate of Expense required to construct a Dredging Machine, making use of certain machinery now in store, to rest upon two Native Boats strongly bound together, with sleepers and a platform, &c. &c., with two Mud Boats attached.

IRON WORK.	Wt.	Price.
The chain buckets, rollers, and frame for the same are complete, but not put together.		
Required the two hanging blocks for tumbler gudgeons, ..	20 Srs. each.	30 0 0
„ 2 Gudgeons for lower tumbler,	20 Srs. each,	30 0 0
„ A large cog-wheel of 6 feet diameter, fitted to tumbler shaft—Jessop's estimated price, ... ..	...	550 0 0
„ 6 Gudgeon steps for 4 in. gudgeons, bolts complete,	20 Srs. each,	90 0 0
„ 16 Gudgeons to two shafts, with winches, ...	10 Srs. each,	120 0 0
„ 2 Shafts bent, each into 4 winches, with 9 inches brass pinions (now in store), fitted to them, ...	at 3 Mds. each.	180 0 0
„ An axle for centre-wheel and pinion, ... ..	...	30 0 0
„ 6 Large iron knees with bolts, ... ..	...	60 0 0
„ 40 Nut bolts of different sizes,	at 25 per Mds.	40 0 0
„ Expenses of fitting up the frame, fixing rollers, chain, &c. &c., ... ..	...	180 0 0
BOATS, PLATFORM AND UPRIGHTS.		
Two 500 maunds boats purchase,	at 300 each,	600 0 0
Sleepers, platform, anchors, &c. &c., .. ..	...	800 0 0
CONTINGENT.		
Expenses of yard tools, supervision and breakage, {	at 20 per cent. on the whole, }	444 0 0
2 Mud Boats with reservoir and shutters, for emptying mud of Native Craft,	200 Mds. each.	500 0 0
EXTRA CHARGES THAT MAY POSSIBLY BE NECESSARY, although uncertain		
Agreeable to Mr. Jessop and Mr. May's information, the iron rollers are badly contrived, and should be replaced by wooden rollers, plated with iron, which will cause an extra expense of at least, ... ..	...	250 0 0
The buckets likewise are ill-formed for shallow water, and will require some alteration, say costing, ... ..	...	200 0 0
The present small cog-wheel and brass pinions appear slight, and may not be fit for the purpose, their replacement by one small iron pinion would cost, ... ..	...	200 0 0
Sicca Rupees, ... ..	...	4,304 0 0

CALCUTTA :
26th October, 1826.

(Signed) THOS. PRINSEP, Lt. Engineers.

A True Copy,

J. N. JACKSON,

Secretary Canal Committee.

No. 56

No. 98.

To H. T. PRINSEP, ESQ.

Acting Secretary to Government, Territorial Department.

SIR,

I have the honor by desire of the Canal Committee to acknowledge their receipt of your letter No. 1344, under date the 23rd ultimo, and in reply to the concluding Paragraph of it, to forward for submission to Government the copy of a Report received from Lieutenant Prinsep, upon the present state of the Entally Canal, from below the Coolyah Bridge to the Salt Water Lake, the deepening and clearing of which, and the Channel through the Lake, are the primary objects on which he will be engaged during the present season.

2. The Committee beg to recommend to the particular attention of Government the 2nd, 4th, 8th, and 9th Paragraphs of Lieut. Prinsep's Report, from which it will be seen, that little essential benefit can be anticipated from any excavation of that Canal, without an extension of the breadth and an improvement of the Banks, by giving the slope of the latter a greater degree of inclination in order to prevent the injurious effects arising from their actual steepness, thereby preventing the serious injury the Banks are at present liable to.

3. The Committee therefore would beg to submit to Government the expediency of adopting the suggestion offered in the 8th Paragraph of Lieutenant Prinsep's Letter, should the Right Honourable the Vice-President in Council consider it advisable to do so, with reference to the Report of the Collector of Calcutta on the state of that Canal.

4. The land that would be required to effect the object contemplated by Lieut. Prinsep, the Committee apprehend could not be purchased at a lower rate than 100 Rupees per Cottah, which, for the whole extent required for the additional breadth and new roadway, being about (7) seven Biggahs, would amount to Rs. 14,000.

5. The Committee, with reference to the 12th, 13th, and 14th Paragraphs of Lieut. Prinsep's Letter, have instructed him to commence operations in the manner therein proposed, and with a view to avoid delay at this season in advancing the progress of the work, have placed at his disposal the sum of Sa. Rs. (1,000) one Thousand, out of the Balance of Sa. Rs. 3,785, understood to be available in the Treasury of the Collector of the 24-Pergunnahs, pending the orders of Government on the measures requisite to obviate the defects of the existing Balliah Ghat Canal.

6. The preparation of Dredging Machinery for deepening the Channel through the Lake has already been authorized, and is in progress, but the Committee are much disposed to concur in opinion with Lieut. Prinsep, that it would be unadvisable to Bund up that Channel in the manner suggested by the late Major Schallch, as serious injury might accrue, from causing too great a rise in the body of water in the Canal itself, and thereby destroying in a great measure the drainage of the Town.

7. The Estimate in gross called for by you is herewith submitted, from which it will be seen, that an assignment to the amount of Sa. Rs. 2,89,920 will be required to enable the Committee to continue the purchase of the Lands "on that side of the line of communication, so as to continue the Canal progressively Westward."

8. It will, should the Government approve of the suggestions offered by Lieut. Prinsep for deepening and clearing the existing Canal, be requisite, that a further assignment should be made in favor of the Committee for Sa. Rs. 14,000, the sum required to purchase the land mentioned in the 4th Paragraph of this letter, together with the sum of Sa. Rs. 4,903 : 8, being the amount of Lieut. Prinsep's Estimate, making a total of Sa. Rs. 18,903 : 8.

I have the honor to be,

Sir,

CANAL COMMITTEE'S OFFICE,

CALCUTTA :

2nd December, 1826.

Your most obedient Servant,

J. N. JACKSON,

Secretary Canal Committee.

No. 59.

To CANAL COMMITTEE.

Revenue.

GENTLEMEN,

I am directed to acknowledge the receipt of two letters from your Committee, dated 2nd and 20th instant, on the subject of the expense and nature of the operations to be put in hand this season by the Superintendent of Canals, and likewise stating the value of that portion of the ground required for the Canal which lies between the Salt Water Lake and Maniktulla.

2. With respect first to the Works of the season, the Estimate furnished to the Committee on the 16th instant, and forwarded in the letter last received, assumes a total expense of 42,707 : 8 : 0,* viz. for preparing and working the Dredging Apparatus to be used in the Salt Water Lake, 5,304 0 0†
 For a new cut of 1½ mile from Gabtulla to Dara, 15,000 0 0
 For clearing and bunding preparatory to further excavation from Bay-leystone to the Chowmooh, 7,500 0 0
 For completing the unfinished cuts from Hooseinabad with the Kul-looar Dam, 10,000 0 0
 And for deepening the Balya Ghaut Canal, 4,903 8 0

42,707 8 0

3. In addition to the charges here enumerated, the Committee state a further incidental expence that will arise from the necessity of widening the Balya Ghat Canal, for which purpose the requisite ground is assumed by the Committee to cost about 14,000 Rupees; supposing this to be authorized, the total charge of the season would be 56,707-8.

4. But it occurs to the Vice-President in Council that when the land was procured for excavating the last mentioned work, the bare water-way could not have been all that was bargained for and taken by Government. Some space must have been allowed for the bund or road to be thrown up on each side, and this will probably afford a sufficient means of adding to the present breadth of the water-way by narrowing into a foot-path, or eventually by sacrificing altogether one of these roads. His Lordship in Council directs therefore, that before making any bargains for land for widening the Canal, the Committee will ascertain by reference to the Office of the Board of Revenue or that of the Collector of the 24-Pergunnahs, how much land was purchased on that occasion, and whether the space requisite to widen the Canal is not now the property‡ of Government.

5. Putting this item out of the question for the present, the year's operations will cost on the rough estimate about 42,707, which amount His Lordship in Council sanctions to be disbursed, and assignments will be granted to the Committee for the purpose by the proper Officers of Account.

6. In addition to these charges, the outlay requisite to obtain ground for the new cut from the Salt Water Lake to Maniktulla, is estimated by the Committee at 2,89,920, and the expediency of commencing the excavation of the cut as soon as possible, preparatory to opening the communication between the Hooghly and Salt Water Lake, is urged by every consideration having a view to ultimate profit from the undertaking.

7. Under these circumstances, His Lordship in Council, notwithstanding that the period is inconvenient for sanctioning any considerable outlay, thinks nevertheless that

*Erroneously summed up 32,707-8 in the Estimate.

† Of this sum the expense of the Dredging Apparatus Rs. 4304 was sanctioned on the 23rd ultimo.

‡ See Nos. 63, 63 a. 72 b. and Nos. 68 and 69, pages 145-6, Nos. 71, 72, 72 a. 72 c. pages 147, to page 150 of this Appendix.—J. M.

it would be inadvisable to suspend the purchases altogether. I am accordingly directed to call on you to state your opinion as to the practicability of making your further purchases with a stipulation for payment on the day of final occupation for the purposes of Government, or if it be preferred by the parties, they might receive payment at their option in paper of the last Five per Cent. Loan or in Treasury Notes, bearing five per Cent. payable at the end of two years.

8. In so far as the purchases will have to be made from ryots and others occupying and living on the ground, the first mentioned proposition might to them be most acceptable ; but if much of the land has to be procured from wealthy Natives or from Europeans, they would probably prefer to close the bargain at once by taking the paper security proffered.

9. In stating your sentiments on the above proposal, you will of course mention what proportion of the land you reckon to have to procure from each of the above classes.

I have, &c.

The 29th December, 1826.

(Signed) H. T. PRINSEP.
Acting Secretary to Govt., Territorial Department.

FINIS.

APPENDIX TO APPENDIX H.

TO

SECOND REPORT OF COMMITTEE

UPON

T H E F E V E R H O S P I T A L

AND

MUNICIPAL IMPROVEMENTS:

CONTAINING

**PAPERS SELECTED FROM THE PROCEEDINGS OF THE MILITARY BOARD IN THE CANAL
DEPARTMENT, FORMING A CONTINUATION OF THOSE SELECTED FROM THE RECORDS
OF THE LATE CANAL COMMITTEE AND PRINTED IN APPENDIX (H.)**

CALCUTTA :

Bishop's College Press.

1848.

APPENDIX TO APPENDIX (H)

Index.

Papers selected from the Proceedings of the Military Board in the Canal Department, forming a continuation of those selected from the Records of the late Canal Committee.—See Index to App. (H)

	PAGE.
No. 1. Letter from Secretary to Canal Committee, dated 20th December 1830, to Secretary to Military Board, transmitting the Papers &c. enumerated in the Paper marked No. 1. a.	Military Board's Proceedings, 21st Dec. 1830. No. 5.
No. 1. a. List of the Records, furniture, &c. attached to the Canal Committee's Office.	Ditto ditto, No. 6.
No. 2. Letter from Secretary to Military Board, dated 18th January 1831, No. 346, to James Prinsep, Esq. Superintendent of Canals, acquainting him that Lieut. Colonel Tickell, Superintending Engineer, Lower Provinces, has been directed to assume a general control over all works placed immediately under Mr. Prinsep's Superintendence, and that in future, Mr. Prinsep is directed to transmit all his Papers, &c., relative to the Canals through the Officer above mentioned.	Ditto, 8th Feb. 1831, No. 46.
No. 3. Letter from the Secretary to the Military Board, dated 18th January, 1831, No. 363, to Superintending Engineer, L. P., stating that Mr. James Prinsep, Superintendent of Canals, and Captain Baker, Superintendent for Iron Bridges, have been directed to transmit through him to the Board, the Correspondence, &c. connected with their respective duties; and requesting the Superintending Engineer, on returning to the Presidency, to inspect the new line of Canal from the Eshamuttee River at Hosienabad to Calcutta, and stating that the object of the Board is to ascertain,	Ditto ditto, No. 47.
1st. The actual state of the new line of Canals with reference to facility of Navigation, both for light and heavy Craft.	
2nd. How far in its present state that line affords a communication preferable to that by the Old Route through the Soonderbuns by Tolley's Nullah, supposing that Nullah to be fully navigable. and also taking the Nullah in its present state.	

3rd. Whether the Superintending Engineer deems it practicable to render the new line of Canal fully and freely navigable, and if so, at what scale of expense, and requesting to be furnished with any observations that the Superintending Engineer may have to offer, that may guide them in determining whether or not the work, being practicable, should be prosecuted as essentially useful, or abandoned. (Vide Paper marked No. 34.)

Military Board's
Proceedings, 8th
Feb. 1831, No. 45.

No. 4. Letter from the Military Board, dated 8th February 1831, (No. 726,) to the Honorable Vice-President in Council, submitting for the opinion of Government, whether the Board are competent to pay interest on a sum due for ground purchased for the Circular Canal, and kept in deposit in consequence of disputed Title, and transmitting copy of the Advocate General's opinion on the subject.

Ditto, 15th Feb.
1831, No. 45.

No. 5. Letter from the Secretary to the Military Board, dated 17th January, 1831, No. 322, to the Secretary of the Marine Board, and to the Master Attendant, requesting to be furnished with a Memorandum, shewing the strength of current in the Hooghly between Baloo Khal and Tolley's Nullah, or in any part of the Stream between those points during ebb spring tides at the Freshes in August and September, stating the greatest velocity of current that has been observed in miles per hour.

Ditto ditto, No. 7.

No. 6. Letter from the Deputy Master Attendant, dated 19th January 1831, to Secretary to Military Board, stating that between Baloo Khal and Tolley's Nullah, the ebb in his opinion, runs from 5 to 7 miles per hour during spring tides in the months of August and September.

Ditto ditto, No. 8.

No. 7. Letter from the Secretary to the Marine Board, dated 4th February 1831, to Secretary to Military Board, stating that the Marine Board have no means of furnishing the information required by the Military Board—but if the Military Board desire that the matter should be determined by experiment during the next Freshes, directions to that effect will be given by the Marine Board.

Ditto ditto, No. 9.

No. 8. Letter from Secretary to Military Board, dated 15th February 1831, No. 772, to the Secretary to the Marine Board, stating that the Military Board gladly avail themselves of the offer made by the Marine Board of ascertaining by experiment, the strength of current in the Hooghly between the Baloo Khal and Tolley's Nullah.

Ditto, 22nd Feb.
1831, W. W. Nos.
89 and 90.

No. 9. Minute, dated 25th January 1831, by Lieutenant Colonel Galloway, urging, with reference to the Papers marked in the Board's Proceedings as Nos. 85 to 88, printed as Nos. 128, 130, 131, in App. H. that the projection of the New Circular and Soonder-

bund Canals appear to be defective in design, that they hold out no advantages commensurate at all with the cost of the undertaking, whilst he conceives it to be attended with considerable risk of injury to the Navigation of the Hooghly below Calcutta, and by no means free from danger to that City, and recommends that the work be entirely suspended.

No. 10. Minute, dated by Colonel Sir Thomas Anburey, on the above.

Military Board's
Proceedings 22nd
Feb. No.

No. 11. Minute by Lieutenant Colonel J. Craigie, dated 31st January 1831, urging with reference to the above, that the scheme of operations proposed by Mr. Prinsep for the present season should be approved, and more particularly that the execution of the Circular Canal should be prosecuted to completion with the utmost energy, in order that the State may as early as possible reap the benefit to be derived from that work and from the other portions of the Eastern Canal which have been executed.

Ditto ditto No. 91.

No. 12. Minute, dated 8th February 1831, by D. McFarlan, Esq. agreeing, with reference to the above, with the sentiments entertained by Colonel Craigie.

Ditto ditto No. 92.

No. 13. Additional Minute by D. McFarlan, Esq., dated — with reference to the above, and transmitting the Paper marked No. 13. a. ...

Ditto ditto No. 93.

No. 13. a. Note by Mr. Blechynden, Superintendent of Roads, on the effect which the admission of the River into the Mahratta Ditch would have on Calcutta.

Ditto ditto No. 94.

No. 14. Additional Minute, dated 12th February 1831, by Colonel Sir Thomas Anburey, urging, with reference to the above, that the Circular Canal should be pushed on to conclusion with the utmost vigor, and that any further very expensive operations should be discontinued on the Eastern or Soondurbun Canal, without reference to any future returns or advantages therefrom.

Ditto ditto No. 95.

No. 15. Letter from Secretary to Military Board, dated 22nd February 1831, No. 1037, to the Vice-President in Council, transmitting the Papers marked Nos. 9. to No. 13. a. inclusive.

Ditto ditto No. 96.

No. 16. Statement of Lands, about 168 Beegahs, purchased for the Circular Canal, from the 1st October 1828.

Ditto, 1st March
1831, No. 31.

No. 17. Letter from Superintendent of Canals, dated 8th February 1831, to Secretary to Military Board, returning the Paper marked No. 17. a., transmitted in his Letter of the 2nd February 1831.

Ditto ditto No. 33.

No. 17. a. List of Lands, about 27 Beegahs, remaining to be purchased for

Ditto ditto No. 32.

the Circular Canal, 6th January 1831, with marginal observations by the Superintendent of Canals.

Military Board's
Proceedings, 1st.
Mar. 1831, No.

No. 18. Letter from the Military Board, dated 1st March 1831, to the Hon'ble the Vice-President in Council, transmitting the Papers marked No. 16, 17, and 17. *a.*, and applying for an assignment of Rs. 1,40,000, for the purchase of Lands required for the construction of the Circular Canal.

Ditto, 22nd March
1831, No. 31.

No. 19. Letter from Secretary to Military Board, dated 22nd March 1831, No. 1325, to Superintendent of Canals, requesting him to state, according to the latest and best information in his possession, the comparative length of time required for Boats of different descriptions and burthen using sails and oars respectively, to make the passage by the Old Soondurbun and by the New Canal Routes.

Ditto 29th March
1831 No. 9.

No. 20. Letter from Secretary to Military Board, dated 15th January 1831, No. 319, to the Collector of Calcutta, requesting to be furnished with a Statement of the number of Boats which have passed through Tolley's Nullah monthly within this last year, and stating the amount of duty realized.

Ditto ditto No 81.

No. 21. Letter from Superintending Engineer, Lower Provinces, dated 16th February 1831, to Military Board, transmitting the Papers marked No. 21. *a.* and 21. *b.*

Ditto ditto ditto.

No. 21. *a.* Letter from Superintendent of Canals, dated 8th February 1831, to Superintending Engineer, L. P. reporting that a portion of the Circular Canal has been filled up to a considerable extent by the Earth washed down through the City and Narkooldangah Drains.

Ditto ditto ditto.

No. 21. *b.* Letter from the Superintendent of Canals, dated 9th February 1831, to Superintending Engineer, L. P. on the expediency of deepening the Entally Canal, where it is joined by the Circular Canal.

Ditto ditto No. 82.

No. 22. Letter from the Superintendent of Canals, dated 1st March 1831, to Superintending Engineer, L. P. stating that 200 feet of the bed of the Circular Canal has been filled up to the extent of 3½ feet by the deposit from the Bythukkhanna Drain, and that it is necessary that the deposit should be early removed.

Ditto ditto No. 83.

No. 23. Letter from the Superintendent of Canals, dated 10th March 1831, to Secretary to Military Board, stating that the Entallee Canal is choked up with deposit from the Dhurumtollah Drain to the Koolea Bridge, to an average depth of 5½ feet, or 834 chowkas, to remove which it will cost about Rs. 3,500; that if

the deposit is allowed to increase, it will impede the entrance into the Circular Canal, and cause a deposit in it; and that the Eastern Canal was cleared to a foot below the Zero on the Koolea Bridge in the year 1826, and 1827, at a cost of Rs. 4,522:14:5½ for 1182 chowkas, including the sloping of the Banks. ...

- No. 24. Letter from the Local Commissioner of Revenue, dated 25th March 1831, to the Secretary to the Military Board, transmitting copy of a Report in Bengalee from the Collector of Calcutta, complaining that much inconvenience is suffered, by the Eastern Canal not being kept properly clear, and requesting the evil may be remedied.
Military Board's
Proceedings, 29th
March 1831, No.
33.
- No. 25. Letter from Secretary to Military Board, dated 29th March 1831, No. 1403, to Superintendent of Canals, requesting a Report, according to the latest and best information in his possession, on the number of Boats and Craft of different descriptions, which on an average pass daily or monthly through the Old Sunderbund and New Canal Routes respectively.
Ditto ditto No. 33
- No. 26. Letter from the Collector of Calcutta, dated 29th March 1831, transmitting the Papers marked No. 26. a. and No. 26. b. ...
Ditto ditto, No. 10.
- No. 26. a. Statements, shewing the number of Boats which have passed through Tolly's Nullah during the year 1829-30.
Ditto, ditto, ditto.
- No. 26. b. Statement, shewing the number of Boats with Firewood which have passed through Tolly's Nullah during the year 1829-30.
Ditto, ditto, ditto.
- No. 27. Letter from Military Board, dated 29th March 1831, No 404, to the Vice-President in Council, transmitting a copy of the Paper marked No. 23, and requesting that an assignment of Sa. Rs. 3,500 be granted to the Superintendent of Canals for deepening the Entallee Canal.
Ditto, ditto, No.
- No. 28. Letter from the Superintendent of Canals, dated 15th April 1831, to the Secretary to the Military Board, in reply to the Papers marked No. 19. and No. 25.
Ditto, 3rd May
1831, No. 20.
- No. 29. Letter from the Secretary to the Military Board, dated 19th April 1831, No. 1657. to Superintending Engineer, Lower Provinces, transmitting the Paper marked No. 28, and with reference to the 10th Paragraph of it, requesting him to call on the Superintendent of Canals to submit whatever further observations may have occurred to him relating to the advantages or disadvantages of the Eastern Canal.
Ditto, ditto, No.
- No. 30. Letter from the Superintending Engineer, L. P., dated 26th April 1831, to Secretary to Military Board, in reply to the Paper marked No. 29.
Ditto, ditto, No. 23.

Military Board's
Proceedings, 17th
May 1831, No.

* Since executed.
—J. M.

- No. 31. Letter from the Military Board, dated 28th April 1831, No. 1803, to the Honorable the Vice-President in Council, transmitting a proposition by the Superintendent of Canals with remarks by the Chief Magistrate on the same, for erecting a *Bridge over the Circular Canal between the Maniktollah and Dum-Dum Bridges.
- Ditto, 17th May 1831, No. 19. No. 32. Letter from Lucknoth Ghosal, dated 19th April 1831, to Secretary to Military Board, offering to pay Rs. 250 per annum, for the Farm of the Fishery of the Circular Canal from Boitaconnah to Baugbazar, whilst that Canal's communication with the River is unopened.
- Ditto ditto, ditto. No. 33. Letter from the Secretary to the Military Board, dated 19th April 1831, No. 1669, to Superintendent of Canals, transmitting for his opinion, the Paper marked No. 32.... ...
- Ditto ditto, No. 61. No. 34. Letter from Superintending Engineer, Lower Provinces, dated 19th April 1831, to Secretary to Military Board, in reply to his Letter of 18th January 1831, marked No. 3, reports on the Navigation and state of the new line of Canals, from Eshamuttee River at Hoseinabad to Calcutta.
- Ditto ditto, No. 51. No. 35. Letter from the Superintendent of Canals, dated 4th May 1831, to Secretary to Military Board, in answer to the Paper marked No. 32, recommends that the application of Lokenoth Ghosal, to Farm the Fishery of the Circular Canal be rejected; and adverts to the inconvenience and extortion resulting from farming Ferries over the Mofussil Canals.
- Ditto ditto, No. 51. No. 35½. Minute by Colonel A. Galloway, dated ... on the Paper marked No. 35.
- Ditto ditto, No. 53. No. 36. Letter from Superintendent of Canals, dated 4th May 1831, to Secretary to Military Board, transmitting the Paper marked No. 36. a. and stating with reference to the Estimate for deepening the Balliaghat Canal, which has been sanctioned, that he has been obliged to postpone the execution of that work until after the rains, as at present it would be very inconvenient to close the Dhurumtollah Drain; that in anticipation of the Board's orders, he had cleared away the deposit from the mouths of the Boitaconnah and Narcoaldanga Drains, that through the unskilfulness of the head Bricklayers, some of the Drains at first constructed were made higher than he intended, but that as they all allow a sufficient slope from the Circular Road Drain Floors, he has not thought it necessary to alter them.
- Ditto ditto, ditto. No. 36. a. Table of the Levels of the Floors of the Town Drains towards

- the Circular Canal referred to the Zero or average Level of the Salt Water Lake, as fixed by the late Superintendent.
- No. 37. Letter from Superintending Engineer, L. P., dated 10th May 1831, to Secretary to Military Board, transmitting the Paper marked No. 37. a. Ditto ditto, No. 65.
- No. 37. a. Letter, dated 5th May 1831, from Superintendent of Canals to Superintendent of Public Works regarding the relative advantages and disadvantages of the New Eastern Mofussil Canals. Ditto ditto, No. 55
- No. 38. Minute by Colonel A. Galloway, dated 16th May 1831, on the Paper marked No. 36. and No. 36. a. Ditto, ditto, No.
- No. 39. Letter from Secretary to Military Board, dated 17th May 1831, No. 299, to the Honorable Vice-President in Council, transmitting the Paper marked No. 37. and No. 37. a. Ditto ditto, No. 56.
- No. 40. Letter from the Military Board, dated 17th May 1831, No. 251, to the Vice-President in Council, transmitting the Paper marked No. 35½, and an Extract of the Paper marked No. 35. ...
- No. 41. Letter from Secretary to Military Board, dated 17th, May 1831, No. 300, to Superintending Engineer, Lower Provinces, stating that the Board considers his Report of the 19th April instant clear and satisfactory, and requesting him to concert with the Superintendent of Canals to take into consideration the Plan, by the late Superintendent, of manœuvring the Gates at Chitpore, and the feasibility or otherwise of constructing series of Canal Locks, capable of ensuring the ingress and egress of Craft at all times, and at all relative Levels of the Canal and River however varying. Ditto ditto, No.
- No. 42. Letter from Deputy Secretary to Government, dated 24th May 1831, to Military Board, in reply to their Letters of the 22nd February, 3rd March, and 26th April 1831, states, that the Vice-President in Council concurs in the opinion of the Majority of the Board, who are in favor of the vigorous prosecution of the Circular Canal Works; that the suggestion to leave the Eastern Canals in their present state for a year or two, in order that a more correct judgement may be formed of their success; and that the Towing paths only should be cleared and smoothed, is approved. Ditto 7th June 1831, No. 8.
- No. 43. Letter from the Superintendent of Canals, dated 30th June 1831, to Superintending Engineer, L. P., stating, with reference to the Petition relative to the Land taken for the Chythal Canal, that a remission of 8 annas rent per Biggah will be equitable. Ditto, 12th July 1831, No. 41.

Military Board's
Proceedings, 23rd
August 1831, No.
19.

No. 14. Letter from Mr. J. Siret, dated 1st August 1831, to Military Board, offering to construct the New Road as well as side Drains and Bridges on the sides of the Circular Canal, at the following rates; viz.

1. For laying double bricks on the centre of the Roads and single bricks on the sides, with 6 inches of koah on the top, per 0/0 feet, Rs. 0
Ditto single bricks, with 9 inches of koah, 0
For constructing Kutcha Roads on the side of the Puckah, per 0/0 feet, Rs. 1 0 0
Ditto making Puckah Drains on the sides and Bridges across the Roads, per 0/0 feet, ... Rs. 14 0 0

Ditto, 6th September 1831, No. 38.

No. 45. Letter from Superintending Engineer, L. P., dated 15th August 1831, to Secretary to the Military Board, transmitting the Paper marked No. 45. a.

Ditto ditto,

No. 45. a. Letter from Superintendent of Canals, dated 10th August 1831, to Superintending Engineer, L. P., reporting that the Circular Canal is now ready for the admission of Boats from the Eastward through the Salt Water Lake, drawing 4 or 5 feet of water.

Ditto ditto, No.

No. 46. Letter from the Military Board, dated 6th September 1831, No. 1850, to the Vice-President in Council, transmitting the Papers marked No. 45. and 45. a, and recommending that the Circular Canal be immediately thrown open to Navigation for all Boats, drawing from 4 to 5 feet of water—but that no Toll be levied till the communication is complete (Lieutenant Col. Galloway dissents in opinion, and recommends a Toll be levied immediately); that sale of Land be postponed for the present, but that in the meantime, the allotments may be let.

Ditto, 27th September 1831, No. 11.

No. 47. Letter from the Deputy Secretary to Government, Territorial Department, dated 13th September 1831, to Military Board, stating in reply to their letter of the 6th instant, that his Honor the Vice-President in Council is of opinion, that to admit Boats into the Circular Canal only for a short time, free of Duty, would create discontent hereafter, that the Board should take the subject of the Tolls maturely into their consideration, and propose such modifications as to them may appear necessary, and that the ground on the Banks of the Circular Canal may be leased out for periods not exceeding one year.... ..

Ditto ditto, No.

No. 48. Letter from Secretary to Military Board, dated 27th September, 1831, to Secretary to Sudder Board of Revenue, requesting the sentiments of the Board, on the revised rate of Toll which might be levied on Boats passing through Tolly's Nullah and the Circular Canal.

No. 49. Memorandum by the Chief Magistrate, dated 17th October 1831, to Military Board, stating the amount of Toll to be levied at the Circular Canal being about to be settled, suggests the propriety of adopting certain measures connected with the Land on the sides of the Canal, previous to the Toll taking effect.

No. 50. Letter from the Secretary to the Military Board, dated 25th October 1831, to Superintendent of Canals, requesting him to divide into such allotments as may appear most convenient and advantageous, the excess of ground on the sides of the Circular Canal.

Ditto ditto, No.

No. 51. Letter from the Military Board, dated 25th October 1831, to the Superintending Engineer, L. P., transmitting a copy of the Paper, marked No. 50.

Ditto ditto, No.

No. 52. Minute by D. McFarlan, Esq., dated 26th October 1831, with connected Papers with reference to the Government Order of the 30th September last, on the proposed opening of the Circular Canal, and urging that an equal Toll should be levied on Tolley's Nullah and the Circular Canal, and refers to the Government Regulation No. XVIII. of 1806, and No. VII. of 1810. ...

Ditto 8th November
1831, No. 37.

No. 53. Minutes on the above by the Members of the Board, approving generally of Mr. McFarlan's suggestions.

Ditto ditto ditto.

No. 54. Letter from the Magistrates of Calcutta, dated 2nd November 1831, to Deputy Secretary to Government, stating that the progress of the execution of the Circular Canal is about to obliterate some portions of the old Mahratta Ditch, laid down as the Legal Boundary of the Town of Calcutta under a Government Proclamation, an Extract of which, marked, No. 55. *a.* is annexed; that it is desirable that the actual limit of jurisdiction should not be uncertain and undiscoverable, that it should not be a fictitious line or a mere line on Paper, but something substantial, not liable to pass out of men's memories, or to be insensibly encroached upon by neighboring inhabitants, and that to provide against this last occurrence here, either of the following Plans would answer; viz.

Ditto, 22nd Nov.
1831, No. 37.

1st. The erecting a wall on the site of the old Boundary.

2d. Having small Drains kept up, shewing the old channel.

3d. The Jurisdiction being extended to the Circular Canal under the Provision Chap. 84 of the 55 Geo. III. that for the purposes of the Police, and prevention of Smuggling, the Canal would be the best Public Boundary, though as stated for other reasons objectionable.

No. 54. *a.* Extract of a Proclamation relative to the limits of the Town.

Ibid.

Military Board's
Proceedings, 22nd
Nov. 1831, No. 58.

No. 55. Letter from the Deputy Secretary to Government, dated 8th November 1831, to the Justices of the Peace for the Town of Calcutta, stating, with reference to the Papers marked No. 54, and 54. a. that several objections exist to adopting the 3rd Plan proposed by them; that independent of those objections, the jurisdiction to be extended would require the sanction of the Court of Directors and Board of Commissioners, and consequently involve the delay of a reference to them. That the terms of the old Proclamation appear to the Honorable the Vice-President in Council to point out the most convenient method of marking the Boundary; that accordingly His Honor is prepared to sanction the expenses of a Drain and of sunken masonry marks to be constructed, as nearly as possible, identical with the present boundary and posts, or metas.

Ditto ditto, No. 22. No. 56. Letter from Deputy Secretary to Government, dated 15th November 1831, to Military Board, sanctioning the admission of Boats into the Circular Canal on Payment of a duty of 50 per cent. over and above that levied on Boats entering the Intallee Canal, under Regulation VII. of 1810, and authorizing the removal of the Toll Chowkey to the junction of the Intallee and New Circular Canal.

Ditto ditto, No. 56. No. 57. Letter from D. McFarlan, Esq. dated 19th November 1831, to Secretary to Military Board, transmitting the Paper, marked No. 54, No. 54. a. and No. 55, and requesting that the Superintendent of Canals may be directed to proceed agreeably with the instruction conveyed in the 5th Paragraph of the Paper marked No. 55.

Ditto ditto, No. No. 58. Letter from Secretary to Military Board, dated 22nd November 1831, to Superintendent of Canals, transmitting copies of the Papers marked No. 55 and No. 57, and requesting him to act agreeably with the instruction conveyed therein.

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Ditto ditto, 29th
November 1831,
No. 34. No. 59. Letter from Assistant Secretary to Sudder Board of Revenue, dated 18th November 1831, to Secretary to Military Board, stating that the Sudder Board concurs in the arrangement made for levying a temporary duty of 50 per cent. over and above the rate prescribed for the Entally Canal on all Boats entering the Circular Canal.

Ditto, 6th Decem-
ber 1831, No. 29. No. 60. Letter from the Superintending Engineer Lower, Provinces, dated 2nd August 1831, to Secretary to Military Board, transmitting the Papers marked No. 60. a. to No. 60. a. (14.) ...

Ditto ditto, ditto. No. 60. a. Letter from Superintending Engineer, L.P. dated 19th April 1831, to Superintendent of Canals, adverting to their late inspection of the New Canal, requests him to furnish a Report, whether

it would be advisable to have recourse to Bunding and Chowka Work, with reference to a further employment of the Dredging Machine at the mouth of the Entallee Canal.

No. 60 a.(1) Letter from Superintendent of Canals, dated 28th July 1831, to Superintending Engineer, Lower Provinces, in reply to his Letter of the 19th April 1831, transmits the Paper marked No. 60. a. (14). and a Table of Soundings, taken in May, and verified in June 1831, upon comparison of which with the former Soundings, it appears that the Channel has been deepened by the working of Dredging Boats $1\frac{1}{2}$ foot, that he thinks that some error, for which he cannot account, has crept into the Table of Soundings taken in 1827, since they are uniformly nearly 2 feet less than the present Soundings, even beyond the space acted on by the Dredgers; that the average depth of the Channel from Chingreeghatta Salt Works to the 2nd Chokey, or until the depth increases to 8 feet, is now 6 feet 3 inches, being 2 feet 2 inches less than the excavated depth of the Circular Canal, and that he would suggest the Dredging Boats being employed another year at the same spot.

Military Board's
Proceedings, 6th
December 1831,
No. 39.

No. 60. a.(14) Estimate of the probable expense of deepening the Channel at the opening of the Entallee Canal into the Salt Water Lake.

Ditto ditto, No. 39.

No. 61. Letter from Secretary to Military Board, dated 16th August 1831, No. 1478, to Superintendent of Canals, requesting him to state the expense likely to be incurred by Dredging to enable the Board to judge, whether that mode of excavating would not be preferable to hand digging.

Ditto ditto, No.

No. 62. Letter from Superintendent of Canals, dated 3rd November 1831, to Secretary to Military Board, adverting to his letter of the 4th May 1831, states, that he is prepared to commence upon the work sanctioned upon the Estimate of Rs. 3,500, for excavating the upper part of the Intallee Canal.

Ditto ditto, No. 33.

No. 63. Letter from E. R. Barwell, Esq., Local Commissioner, dated 28th November 1831, to the Military Board, transmitting the Paper marked No. 63. a.

Ditto ditto, No. 21.

No. 63. a. Letter from C. Trower, Esq., dated 2nd November 1831, to the Local Commissioner, urging the necessity of repairing the Road along the South [North] side of the Entallee Canal, leading from the Circular Road to the head of the Canal, and making a few Drains.

Ditto ditto, No.

No. 64. Letter from Superintendent of Canals, dated 30th November 1831, to Secretary to Military Board, recommending, with reference to the demarcation of the boundary line of the Mahratta Ditch

Ditto ditto, No. 24. 3

that a person from the Collector's Office, be deputed to point out the width of ground on either side belonging to Government.

Military Board's
Proceedings, 6th
December 1831,
No. 24.

No. 65. Letter from Superintendent of Canals, dated 1st December 1831, to Secretary to Military Board, stating, that the expense of deepening the Channel at the Upper part of the Salt Water Lake by Dredging will be more than double the cost of excavating by hand.

Ditto ditto, No.

No. 66. Letter from Secretary to Military Board, dated 6th December 1831, No. 2943, to Superintendent of Canals, transmitting the Papers marked No. 63, and No. 63. a., and requesting the Superintendent to furnish an Estimate of the Expence of repairing the Road, which runs to the Northward of that Canal, and providing the requisite number of Drains.

Ditto ditto ditto

No. 67. Letter from Secretary to Military Board, dated 6th December 1831, No. 2932, to Superintendent of Canals, authorizing his commencing on the excavation of the upper part of the Entallee Canal upon his Estimate of Sa. Rs. 3,500.

Ditto ditto ditto.

No. 68. Letter from Secretary to Military Board, dated 6th December 1831, No. 2947, to Superintendent of Canals, stating that in the absence of proof to the contrary, the Board are of opinion, that the average high water mark on both sides of the Mahratta Ditch, should be considered as defining the limits within which the ground of the Mahratta Ditch should be considered to belong to Government.

Ditto, 13th Dec.
1831, No. 34.

No. 69. Letter from Superintendent of Canals, dated 7th December 1831, to Secretary to Military Board, suggesting that the Committee appointed to inspect the works of the Canal be directed to report upon the state of the Bythukkhanna Bridge, and to give their opinion on the expediency of completing the Ooltadangah Bridge.

Ditto 27th Dec.
No. 1831, No. 14.

No. 70. Letter from the Superintendent of Canals, dated 2nd December 1831, to Secretary to Military Board, stating that he trusts the Board will waive the necessity of his attesting the Aumeen's Bills on honor, as he considers his signature attached to the bill sufficient for the purpose required.

Ditto ditto, No. 16.

No. 71. Letter from Superintendent of Canals, dated 12th December 1831, to Secretary to Military Board, submitting his remarks for the consideration of the Board, on the subject of the attestation desired of him, and that with reference to the explanation given by him, hopes the Board will waive the declaration required from him, or submit his case to the decision of Government. ...

- No. 72. Letter from Secretary to Military Board, dated 27th December 1831, No. 2973, to Superintendent of Canals, in reply to his Letter of the 2d instant, stating, that the Board cannot think that his compliance with a general and invariable rule of the Service would be derogatory to his character, and that they have no authority to exempt him from the rule.
- Military Board's
Proceedings, 27th
December, 1831,
No. 18.
- No. 73. Letter from the Military Board, dated 27th December 1831, No. 3192, to the Honorable Vice-President in Council, transmitting with observations, the Papers marked No. 70. to No. 72. inclusive.
- Ditto ditto, No 17.
- No. 74. Minute by the Chief Magistrate, dated 1st February 1832, suggesting, that, as the Natives object to take leases for one year, the Government be written to for permission to let out the Lands on the line of the Circular Canal on leases for 5 years; the lessees being entitled to renew their pottahs on paying an increased rate.
- Ditto ditto, No. 69.
- No. 75. Letter from the Superintendent of Canals, dated 23d February 1832, to Secretary to Military Board, tendering his resignation to Government, but offering to complete the Circular Canal without pay, provided he is exempted from the usual Oath and Declaration.
- Ditto 28th Feb-
ruary 1832, No. 19.
- No. 76. Letter from Military Board, dated 28th February, 1832, to Government, transmitting the Paper marked No. 75. and stating, that the Officer selected to succeed Mr. Prinsep, should be one of undoubted talent and experience.
- Ditto ditto, No. 20.
- No. 77. Letter from Military Board, dated 28th February, 1832, to the Vice President in Council, transmitting the Paper marked No. 74.
- Ditto ditto, No.
- No. 78. Letter from C. R. Barwell, Esq. Local Commissioner, dated 28th November, 1831, to Military Board, transmitting the Paper marked No. 78. a.
- Ditto 6th March
1832, No.
- No. 78. a. Letter from Collector of Calcutta, dated 2d November 1831, to the Local Commissioner, recommending with reference to the Estimate of Rs. 3,500, sanctioned for clearing out the Entallee Canal, that the Road leading from the Circular Road to the South [North] side of the Entallee Canal through the Wood Bazar should be repaired, and a few Drains made in that vicinity.
- Ibid.
- No. 79. Letter from Military Board, dated 6th December 1831, to Superintendent of Canals, transmitting the Paper marked No. 78. and No. 78. a.
- Ditto ditto, No.

Military Board's Proceedings, 6th March 1832, No.	No. 80. Letter from Superintendent of Canals, dated 27th January 1832, to Secretary to Military Board, transmitting the Papers marked No. 80. <i>a.</i> and No. 80. <i>b.</i> and submitting a revised Estimate, amounting to Rs. 11,893, for clearing the Entallee Canal and making various Improvements.
Ditto ditto ditto.	No. 80. <i>a.</i> Letter from Superintendent of Canals, dated 24th January 1832, to Collector of Calcutta, stating that he, the Superintendent, had made some additional charges to his Estimate for certain Improvements required.
Ditto ditto, No.	No. 80. <i>b.</i> Letter from the Collector of Calcutta, dated 27th January 1832, to Superintendent of Canals, dissenting with him in opinion respecting the necessity of the Improvements charged in his Estimate.
Ditto ditto, No. 49.	N. 81. Letter from Superintendent of Canals, dated 11th February 1832, to Secretary to Military Board, recommending the purchase of certain Plots of Ground at Chitpore, for depositing earth upon.
Ditto ditto, No.	No. 82. Letter from Military Board, dated 6th March 1832, to the Hon'ble Vice President in Council, with reference to the Papers marked No. 78. and No. 78. <i>a.</i> transmits the Papers marked No. 79. to No. 80. <i>b.</i> with observations thereon.
Ditto 13th March 1832, No. 22.	No. 83. Letter from J. Thomason, Esq., Deputy Secretary to Government, dated 6th March 1832, to Military Board, stating, that Government has authorized the Board to grant Leases of the Land on the Banks of the Canal for 5 years, at the expiration of which period, it will remain to be considered whether the Leases should be renewed, or the Land sold, and requesting the Board to make arrangements for the collection of the Ground Rent of such Lands as may be let, and for levying the Tolls, and transmitting the Papers marked No. 83. <i>a.</i> and No. 83. <i>b.</i> . .
Ditto ditto, No. 23.	No. 83. <i>a.</i> Letter from R. D. Mangles, Esq., Acting Junior Secretary to Revenue Board, dated 21st February 1832, to Deputy Secretary to Government, Revenue Department, relative to the expediency of letting the surplus grounds on the Banks of the New Circular Canal, and suggesting that a Native Ameen be employed instead of Mr. Osborne, a professional Surveyor, for measuring the Government Grounds at the Western end of the Balliaghatta Canal, which the Collector believes to be the subject of encroachment, and stating the inference drawn by the Revenue Board, is, that the Boitakhana and Circular Canal have been placed under the management of the Military Board, and noticing the difficulties arising therefrom, and transmitting Tenders for the farm of the Boitakhana Canal. . .

No. 83. *b.* Letter from Deputy Secretary to Government, Revenue Department, dated 6th March 1832, to the Acting Secretary to Revenue Board, stating, that every thing connected with the Disbursements and Receipts on the Circular Canal should remain under control of the Superintendent of Canals and the Military Board; that the Collector of the Tolls on the Boitakhana Canal may remain as heretofore under the control of the Collector of Calcutta; that if the removal of the Toll Chowkey sanctioned in his Letter of the 15th April 1832, should create any confusion, it need not be carried into effect; that under existing circumstances with reference to an intended alteration in the Tolls, it is not expedient to accept the offers for farming for 5 years the Boitakhana Canal; and that the Board is directed to issue the necessary orders to the Collector for measuring the Lands belonging to Government.

No. 84. Letter from Superintending Engineer, L. P., dated 7th February 1832, to Secretary to Military Board, transmitting the Papers marked No. 84. *a.* No. 84. *a.*⁽¹⁾ to No. 84. *a.*⁽⁷⁾ and stating, that in passing through the Mofussil Canals in January 1832, he found them nearly in the same navigable state as when he passed through them in April 1831, since which the Baminghatta Canal has been completed and thrown open. That, however, there are still many roots and stumps of trees in the *Hoseynabad* and *Baleygunge* Canals and in the *Dansakh*, which from the strength of the current in those Channels render the Navigation difficult and dangerous to deeply-laden Boats; that he would recommend a strong Boat being obtained from the Harbour Master's Department, to be employed to remove the obstructions referred to; that it will be impossible to keep open the Navigation of the Circular Canal except at an enormous expense, if the City Drains are allowed to empty themselves into it; that all that can be done at present, he conceives is, to try the effect of a Dam and Weir at the mouths of all these Drains, and should they fail, the Drainage of the City must be conducted into the Lake by some other Channel; that the Special Committee of Engineer Officers having lately so fully reported on this and on every other point connected with the Circular Canal, that he has nothing further at present to add on the subject.

Ditto 3rd April
1832, No. 91.

No. 84. *a.* Letter from Superintendent of Canals, dated 7th January 1832, to Superintending Engineer, L. P., transmitting the Papers marked No. 84. *a.*⁽¹⁾ to No. 84. *a.*⁽⁷⁾ and stating, that some inconvenience has resulted from the Suspension of the system of Monthly Accounts, though in other respects that arrangement has been attended with advantage.

Ditto ditto ditto.

Ditto ditto, No. 95.

No. 84. *a.*⁽¹⁾ Annual Report by the Superintendent of Canals on the Canal Operations of 1830-31.

Military Board's Proceedings, 3rd April 1832, No. 96.	No. 84. <i>a.</i> ⁽²⁾ General Abstract of Expenses on Mofussil Canal Works, for the season 1830-31, from 1st July 1830, to 30th June 1831...
Ditto ditto, No. 97.	No. 84. <i>a.</i> ⁽³⁾ General Abstract of Circular Canal Works, for the season 1830-31.
Ditto ditto, No. 98.	No. 84. <i>a.</i> ⁽⁴⁾ Statement of the Expense of Excavating, including Contingent Charges of the Circular Canal, amounting to Sa. Rs. 1,06,921 : 6 : 1½ for 44,778 chowkas, averaging Sa. Rs. 2 : 6 : 2 per chowka, the Estimate having been Sa. Rs. 2 : 8 per chowka.
Ditto ditto, No. 99.	No. 84. <i>a.</i> ⁽⁵⁾ List of Outstanding Balances to 30th June 1831.
Ditto ditto, No. 100.	No. 84. <i>a.</i> ⁽⁶⁾ List of Boats which have passed to Calcutta through the Bahminghatta New Canal.
Ditto ditto, No.	No. 84. <i>a.</i> ⁽⁷⁾ Ditto through Tolly's Nullah.
Ditto ditto, No.	No. 85. Letter from Military Board, dated 3rd April 1832, No. 4,795, to the Honorable Vice President in Council, transmitting the Papers marked No. 84. No. 84. <i>a.</i> to No. 84. <i>a.</i> ⁽⁷⁾ inclusive, and with reference to them, state, that they think Mr. Prinsep's Report satisfactory, and that an application has been made to the Harbour Master's Department for the use of a Boat, required to remove the roots and stumps of trees in the Mofussil Canals, and that they, the Board, have authorised the construction of a Dam at the exit of one of the City Drains.
Ditto 17th April 1832, No. 40.	No. 86. Letter from Superintending Engineer, L. P., dated 28th March 1832, to Military Board, transmitting the Paper marked No. 86. <i>a.</i>
Ditto ditto, No. 41.	No. 86. <i>a.</i> Letter from Superintendent of Canals, dated 26th March 1832, to Superintending Engineer, L. P., reporting on the nature of the Soil upon which the foundation of the Chitpore Locks are to be built, ascertained by digging and boring to the depth of 70 feet, the result of which is very favorable.
Ditto 1st May 1832, No. 61.	No. 87. Letter from Secretary to Military Board, dated 12th April 1832, to Capt. F. Jenkins, requesting him to favour the Board with such observations as he may have had an opportunity of making on the state of the New Canals in the Soondurbuns and of the Entallee Canal.
Ditto ditto, No. 62.	No. 88. Letter from Capt. F. Jenkins, dated 16th April 1832, in reply to Secretary to Military Board's Letter of the 12th instant, submits his observations on the state of the New Canals in the Soondurbuns and of the Entallee Canal, and recommends the Roads on either side of the Entallee Canal to be carried

through the Salt Water Lake to Tardah, and Locks being placed at the Lake end of the Entallee Canal, and a cross Cut or Canal made to fall into Tolley's Nullah, below and near Guireahaut, and states the Commerce from the Eastward to be of great and increasing value.

- No. 89. Letter from Secretary to Military Board, dated 1st May 1832, No. 97, to the Honorable Vice President in Council, transmitting the Paper marked No. 88... .. .

Military Board's
Proceedings, 1st
May 1832, No.

- No. 90. Letter from Deputy Secretary to Government, dated 24th April 1832, to Military Board, stating, that the Government concurs in opinion with the Board that Mr. Prinsep's Canal Operations for 1831-32 are satisfactory, and approves that Boats be employed to remove the roots and stumps of Trees in the Mofussil Canals, and that the object in erecting Dams and Weirs at the mouths of the City Drains is important, and requesting that the Government may be informed of the success which may attend the Dam that has been ordered to be experimentally constructed.

Ditto 8th May
1832, No. 13.

- No. 91. Letter from Deputy Secretary to Government, dated 15th May 1832, to Military Board, in reply to their letter of 28th February last, states that the Government accepts the resignation of Mr. J. Prinsep, of the Office of Superintendent of Canals, and appoints Captain Baker, to perform the duties of that office in addition to the one he at present holds on an allowance of Rs. 1,200 per mensem, and requests to know in what portions that sum can be assigned to the two employments.

Ditto 29th May
1832, No. 62.

- No. 92. Minute by the Chief Magistrate, dated 23d June 1832, stating, the necessity of employing two Chowkedars for the purpose of protecting the Government Lands on the East and West sides of the Circular Canal.

Ditto 3rd July
1832, No. 16.

- No. 93. Letter from Secretary to Military Board, dated 3d July 1832, to Chief Magistrate, sanctioning his employing two Chowkedars to prevent encroachments being made on the Government Lands on the sides of the Circular Canal.

Ditto ditto, No. 47.

- No. 94. Two Petitions, dated to the Military Board, complaining of the hardship of being compelled to pay double Toll on Boats entering the Circular Canal from Balleaghatta, and requesting that the Toll may be levied only once, as the persons who engaged to tenant the Land on the sides of the Canal are now unwilling to do so, on account of the double Toll. ..

Ditto 10th July
1832, No. 62.

- No. 95. Letter from Superintending Engineer, L. P., dated 14th June 1831, transmitting the Paper marked No. 95. a.

Ditto ditto No. 63.

Military Board's
Proceedings, 10th
July 1832, No.

No. 95. *a.* Letter from Superintendent of Canals, dated 5th June 1831, to Superintending Engineer L. P., reporting on the effects likely to be produced on the Drainage of Calcutta by the opening of the Circular Canal, and stating, that no danger is to be apprehended from the Lock Passage during the rains, as the Locks can either be closed or kept open as occasion may require.

Ditto ditto, No. 64. No. 96. Minute by Lieutenant Colonel Galloway, dated 13th July 1831, on the Paper marked No. 95. *a.* and referring to Proceedings of the 17th May 1831.

Ditto ditto, No. 68. No. 97. Letter from the Superintendent of Canals, dated 17th December 1831, to Secretary to Military Board, transmitting an Estimate for constructing a double Lock Passage for the Circular Canal, and a Plan of the modification which he proposes to introduce in Captain Prinsep's design for the Chitpore Lock Gates.

Ditto ditto, No. 69. No. 98. Letter from Secretary to Military Board, dated 17th January 1832, to Superintending Engineer, L. P., transmitting a Memoir by the late Captain Prinsep and its connected Papers, and requesting a Report on the best means of effecting a communication between the Canal and River, combining utility with economy.

Ditto ditto, No. 70. No. 99. Letter from Superintending Engineer, L. P., dated 29th February 1832, to Secretary to Military Board, stating, that he has communicated with Captain Forbes on the subject of the Secretary's Letter of the 17th January last, who agrees with him in opinion, as to the necessity of constructing a Lock at Chitpore, as originally intended by the late Captain Prinsep, and transmitting the Papers marked Nos. 99. *a.* to No. 99. *b*½ inclusive.

Ditto ditto, No. 71. No. 99. *a.* Letter from Superintending Engineer, L. P., dated 2d Feb. 1832, to the Superintendent of Canals, requesting his opinion:—
1. Whether there is a necessity for the Lock at Chitpore, and whether any inconvenience or danger would result were a secure entrance Channel, equal in area of the chamber to the intended Lock, left open to the Hooghly. 2. Should he have any doubts on the above, could he conduct during the ensuing rainy season such a set of experiments as would afford sufficient data for estimating the effects that such an influx of water would produce on the Canal and its Banks, on the Level of the Salt Water Lake, and on the Property adjacent to it and the line of Canal. 3. Whether he thinks the Navigation between the Canal and River could be maintained by means of the Log Dams, &c. without the intervention of Locks.

4. Whether he considers the Lock proposed, could have its foundation laid on the sandy soil at Chitpore at the depth planned, 44 feet below the surface, without the aid of a powerful Steam Engine.
- No. 99. *b*. Letter from the Superintendent of Canal, dated 11th February 1832, to Superintending Engineer, replying to the Paper marked No. 99. *a*. Military Board's Proceedings, 10th July 1832, No. 71
- No. 99. *b*₂. Letter from ditto, dated 22d February 1832, to ditto, in continuation of his Letter of the 11th February 1832, marked No. 99. *b*. Ditto ditto ditto
- No. 100. Letter from the Secretary to the Military Board, dated 13th December 1831, to Colonel T. Wood, Major Irvine, and Captain Forbes, appointing them a Committee for the purpose of examining and reporting on the state of the Circular Canal and its Bridges, &c., and whatever may appear to them deserving of notice in respect to the Canal generally. Ditto ditto, No. 72.
- No. 101. Letter from the Committee appointed to Report on the works of the Canal Department, dated 23d January 1832, to Secretary to Military Board, reporting on the several works of the Canal Department, and transmitting an Estimate of the quantity of soil deposited in the Canal during the rains of 1831, by the City Drains. Ditto ditto, No. 74.
- No. 102. Minute by Lieutenant Colonel Galloway, dated 23d March 1832, relative to the Chitpore Lock. Ditto ditto, No. 75.
- No. 103. Letter from Military Board, dated 12th April 1832, to the Honorable Vice President in Council, transmitting the Papers marked Nos. 95. and 95. *a*. No. 97. 99. *a*. to No. 99. *b*₂. inclusive and No. 101. relative to a modification in the Locks originally planned for the Circular Canal, and to the great inconvenience resulting from the mud deposited in the Circular Canal by the City Drains. Ditto ditto, No. 76.
- No. 104. Letter from Secretary to Military Board, dated 29th March 1832, to Superintending Engineer, L. P., in reply to his Letter of the 29th ultimo, (marked No. 99.) states, that there are several objections to the Plan for the substitution of one Lock of 30 or 32 feet breadth for the purpose of admitting Steamers into the Circular Canal, and requesting an Estimate for a Suspension Bridge to be substituted for Draw Bridges. Ditto ditto, No. 77.
- No. 105. Letter from the Deputy Secretary to Government, 3d July 1832, to Military Board, sanctioning the construction of a single Lock Passage to the Circular Canal at a cost of 50,000 Rupees, and transmitting the Paper marked No. 105. *a*. Ditto ditto, No. 78.

- Military Board's Proceedings, 10th July 1832, No. 79. No. 105. *a.* *Letter from the Secretary to the Governor-General, Simlah, dated 12th June 1832, to Deputy Secretary to Government, Revenue Department, in reply to his Letter of 8th ultimo, relative to the Circular Canal.
- * Printed in Appendix I. page 35. J. M.
- Ditto ditto, No. 80. No. 106. Letter from Secretary to Military Board, dated 10th July 1832, to Superintending Engineer, L. P., informing him that the Government have authorized the construction of the Lock at Chitpore, and that the mode of removing the soil deposited in the Canal by hand labour is approved.
- Ditto 17th July 1832, No. 60. No. 107. Letter dated 12th July, from Totaram Bessis and others, offering to farm the Canal from Hosenabad to Bhaminghatta.
- Ditto 24th July 1832, No. 33. No. 108. Letter from Superintending Engineer, L. P., dated 23d July 1832, to Secretary to Military Board, transmitting the Paper marked No. 108. *a.*
- Ditto ditto ditto. No. 108. *a.* Letter from Superintendent of Canals, dated 20th July 1832, to the Superintending Engineer, L. P., in reply to his Letter of —, reports that the Lock Gate at Chitpore may be ready by the 1st of March 1833.
- Ditto 7th August 1832, No. 11. No. 109. Letter from Superintending Engineer, L. P., dated 28th July 1832, to Secretary to Military Board, transmitting the Paper marked No. 109. *a.* and No. 109. *b.*, and recommending the construction of an Iron Suspension Bridge of 100 feet span over the Lock at Chitpore.
- Ditto ditto, No. 12. No. 109. *a.* Letter from Superintendent of Canals, dated 25th July 1832, to Superintending Engineer, L. P., suggesting that the Suspension Bridge over the Lock at Chitpore be of a single span of 100 feet, which will permit the working of counterpoise levers for manœuvring the gates if found necessary to apply them, and allow a clear wharf for tracking boats through, and to lighten them if necessary, or for other purposes; that the difference of expense between the above and making one of three short spans with piers resting upon the walls of the Lock, would be about Rupees 4,500.
- Ditto ditto, No. 19. No. 109. *b.* Letter from the Agent of the Iron Suspension Bridges, dated 23d July 1832, to Superintending Engineer, L. P., stating, that the probable expense for constructing an Iron Suspension Bridge of 100 feet span, and 22 feet width, over the Locks at Chitpore, and allowing a clear space of 33 feet for working Levers, &c. on each side between the piers, would be Rs. 19,500, or with contracted span with 3 curves, Rs. 15,500.
- Ditto ditto, No. No. 110. Letter from Secretary to Military Board, dated 7th August 1832, to Superintending Engineer, L. P., approving of the

Plan of an Iron Suspension Bridge of 100 feet span over the
Chitpore Lock.

- No. 111. Letter from Superintending Engineer, Lower Provinces, dated 15th August 1832, to Secretary to Military Board, transmitting the Paper marked No. 111. a. and recommending that the Level of the large Tank adverted to in the 3rd Para. of that Paper be lowered by means of a Pucka Drain leading into the Canal.
- Military Board's
Proceedings, 4th
September, 1832,
No. 26.
- No. 111. a. Letter from Superintendent of Canals, dated 13th August 1832, to Superintending Engineer, Lower Provinces, reporting the injury caused by the late heavy rain on the 6th, 7th and 8th instant, to the Northern Bank of the Entallee Canal, between the Dhurumtollah Drain and the Koolya Bridge, as also to the New Lock under construction at Chitpore.
- Ditto ditto, No. 27.
- No. 112. Letter from Lieutenant Col. R. Tickell, Superintending Engineer, L. P., dated 27th August 1832, to Secretary to Military Board, in reply to his Letter of the 14th instant, relative to two Bills by Mr. J. Prinsep for clearing out the Entallee Canal, and repairing the Roadway of the Koolya Bridge, and reports his inspection of those works.
- Ditto ditto, No. 13.
- No. 113. Letter from Military Board, dated 4th September 1832, No. 1927, to the Honorable Vice-President in Council, transmitting the Papers marked No. 111. and No. 111. a.
- Ditto ditto, No.
- No. 114. Letter from Secretary to Military Board, dated 4th September 1832, to the Superintending Engineer, L. P., stating, that Mr. J. Prinsep's two bills adverted to in the Paper marked No. 112. have been passed this day by the Board, and transmitted to the Accountant General for adjustment.
- Ditto ditto, No.
- No. 115. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 10th December 1832, to Secretary to Military Board, in reply to his letter No. 3098, of the 4th of the same month, transmits an Estimate for constructing the Pucka Drain on the side of the Old Marhatta Ditch at Chitpore, with a Plan.
- Ditto 29th January
1833, No. 87.
- No. 116. Letter from Superintending Engineer, L. P., dated 27th February 1833, to Secretary to Military Board, with reference to the Paper marked No. 110. transmits the Paper marked No. 116. a.
- Ditto 5th March
1833, No. 54
- No. 116. a. Letter from Captain Fitzgerald in charge of the Iron Bridge Department, dated 26th February 1833, to Superintending Engineer, L. P., intimating that the foundations of the Piers of the Bridge over the Chitpore Lock require to be carried
- Ditto ditto, ditto.

to the depth of 24 feet instead of 12, as proposed by Captain Baker.

- Military Board's Proceedings, 5th Mar. 1833, No. 55. No. 117. Letter from Secretary to Military Board, dated 5th of March 1833, to Superintending Engineer, L. P., stating that Captain Fitzgerald is authorized to carry the foundations of the Chit-pore Lock to the depth proposed.
- Ditto, 19th March 1833, No. 61. No. 118. Letter from Superintending Engineer, L. P., dated 8th March 1833, to Secretary to Military Board, adverting to the above two Papers, transmits a Rough Sketch, shewing the comparative depth of the foundation as originally intended by Captain Baker, and as now proposed by Captain Fitzgerald with remarks.
- Ditto 30th April 1833, No. 4. No. 119. Letter from Secretary to Government, dated 23d April 1833, to Military Board, transmitting the Paper marked No. 119. a.
- Ditto ditto, ditto. No. 119. a. Extract—Proceedings of the Right Honorable the Governor General in Council in the Revenue Department, under date the 19th April 1833,—to Captain J. Thomson, Engineers, appointing him Agent for the construction of Iron Suspension Bridges and the Superintendent of the Circular and Eastern Canals.
- Ditto ditto, No. 42. No. 120. Letter from Superintending Engineer, L. P., dated 25th April 1833, to Secretary to Military Board, reporting that Captain Thomson of Engineers, received charge of the Offices of the Agent for Iron Suspension Bridges and Superintendent of Canals on the 19th instant.
- Ditto 3rd May 1833, No. 47. No. 121. Letter from Superintending Engineer, dated 27th February 1833, to Secretary to Military Board, transmitting the Papers marked No. 121. a. to No. 121. a.(6) inclusive... .. .
- Ditto ditto, No. 48. No. 121. a. Annual Report on Canal operations during the year 1831-32, by Mr. J. Prinsep, late Superintendent of Canals.
- Ditto ditto, No. 49. No. 121. a.(1) Statement of the costs of the Burrisal Lime, forwarded by Captain Murray.
- Ditto ditto, No. 50. No. 121. a.(2) List of Outstanding Canal Balances to 30th June 1832.
- Ditto ditto, No. 51. No. 121. a.(3) General Abstract of Circular Canal Works, from 1st of July 1831 to 30th June 1832.
- Ditto ditto, No. 52. No. 121. a.(4) General Abstract of Expenses on Mofussil Canal Works, from 1st July 1831 to 30th June 1832.

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No. 121. <i>a.</i> ⁽⁵⁾ Statement of mud deposited in the Intally Canal from Dhurumtollah Drain to the Koolea Bridge in 1832.	Military Board's Proceedings, 3rd May 1833, No. 53.
No. 121. <i>a.</i> ⁽⁶⁾ Table, shewing the mud deposited in the Circular Canal between Bytikhana and Manicktollah.	Ditto ditto, No. 54.
No. 122. Letter from Military Board, dated 3d May 1833, No. 11, to the Governor General in Council, transmitting with observations the Papers marked No. 121. No. 121. <i>a.</i> ⁽¹⁾ to No. 121. <i>a.</i> ⁽⁶⁾ inclusive.	Ditto ditto, No.
No. 123. Letter from Secretary to Military Board, dated 3d May 1833, to Superintending Engineer, L. P., transmitting a Copy of the Paper marked No. 121. <i>a.</i> and stating that Captain Thomson has assumed charge of the Circular and Eastern Canals. ..	Ditto ditto, No.
No. 124. Letter from Superintendent of Canals, (Mr. J. Prinsep), dated 24th December 1832, to Secretary to Military Board, reporting the completion of the repair of the Bhytuckhanna Bridge Piers, the Road through the Wood Bazar, and along the banks of the Entallee Canal, and the continuation of the Road from Manicktollah Bridge to Dum-Dum Bridge, and applying for a Committee to inspect the same previous to transmitting his Bills.	Ditto 17th May 1833, No. 46.
No. 125. Letter from Lucknath Ghosaul, dated 17th June 1833, to Military Board, offering 450 Rs. per annum for the farm of the Fishery of the Circular Canal.	Ditto 18th June 1833, No. 16.
No. 126. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 22d June 1833, to Secretary to Military Board, reporting that the Lock Gates at Chitpore are ready for the passage of Boats, and noticing the intention of the Governor General to visit them on Monday morning at 6 P. M.	Ditto 28th June 1833, No. 23.
No. 127. Letter from Captain F. Jenkins, dated 29th June 1833, to Secretary to Military Board, in reply to his Letter of the 25th instant, No. 904, submits his observations and suggestions on the Eastern Canals.	Ditto 16th July 1833, No. 22.
No. 128. Letter from Military Board, dated 16th July 1833, No. 1,241, to the Governor General in Council, transmitting the Paper marked 127.	Ditto ditto, ditto.
No. 129. Letter from Secretary to Military Board, dated 16th July 1833, No. 1,243, to Superintendent of Canals, transmitting the Paper marked No. 127. and requesting his attention to the several suggestions contained therein respecting the Improvement of the Canals.	Ditto ditto, ditto.

- Military Board's
Proceedings, 9th
August 1833, No.
16.
- No. 130. Letter from Superintendent of Canals, (Captain J. Thomson,) dated 24th July 1833, to Secretary to Military Board, in reply to his Letter No. 1243, of the 16th July instant, states that the suggestion in Captain Jenkins' Report (see Paper marked No. 127.) on the Eastern Canal for a continued Tracking Ground and Road along the whole line of the Canals is quite impracticable; that the expense of forming Tracking Paths of even one-half the dimensions proposed by Captain Jenkins, would far exceed any advantage arising from them; and that the Canals are more than sufficient for the intercourse with the adjoining Country, even supposing every Beegah of it under cultivation.
- Ditto 10th Sept.
1833, No. 19.
- No. 131. Letter from Superintending Engineer, L. P., dated 8th June 1833, transmitting the Paper marked No. 131. a.
- Ditto ditto, No. 20.
- No. 131. a. Letter from Superintendent of Canals, dated 5th June 1833, to Superintending Engineer, L. P., submitting certain suggestions on points connected with the Tolls and Regulation of the Canals under his, the Superintendent's charge, and commenting on the Toll Regulations No. XVIII. of A. D. 1806, No. VII. of 1810, and No. VIII. of 1824.
- Ditto ditto, No. 21.
- No. 132. Letter from Superintending Engineer, L. P., dated 15th June 1833, to Secretary to Military Board, transmitting the Paper marked No. 132. a.
- Ditto ditto, ditto.
- No. 132. a. Letter from Superintendent of Canals, dated 11th June 1833, to the Superintending Engineer, L. P., relative to the efficient protection of the Government Lands on the banks of the Canal.
- Ditto ditto, No. 23.
- No. 133. Letter from Superintending Engineer, L. P., dated 2d July 1833, to Secretary to Military Board, in reply to his Letter No. 12 of 3rd May, instant, transmits the Papers marked No. 133. a. and No. 133. a.(1) to No. 133. a.(4) inclusive.
- Ditto ditto, No. 24.
- No. 133. a. Letter from Superintendent of Canals, dated 18th June 1833, to Superintending Engineer, L. P., transmitting the Papers marked No. 133. a.(1) to No. 133. a.(4), and reporting on the general state of the Canals and the works connected with them, with suggestions for their improvement.
- Ditto ditto, ditto.
- No. 133. a.(1) Rough Plan of the Proposed Cess Pools.
- Ditto ditto, ditto.
- No. 133. a.(2) Comparative Estimate of Dredging up the sediment from the Circular and other Canals by Steam Dredgers and hand labour
- Ditto ditto, ditto.
- No. 133. a.(3) Section of the Circular Canal Basin.

No. 133. <i>a.</i> ⁽⁴⁾ Table shewing the Soundings of the Canal from the Lock at Chitpore to the Eshamuttee or Juboona River at Husseina-bad.	Military Board's Proceedings, 10th September 1833, No. 24.
No. 134. Letter from Superintending Engineer, L. P., dated 16th July 1833, to Secretary to Military Board, transmitting the Papers marked No. 134. <i>a.</i> and No. 134. <i>a.</i> ⁽¹⁾	Ditto ditto, No. 25.
No. 134. <i>a.</i> Letter from Superintendent of Canals, dated 10th July 1833, to Superintending Engineer, L. P., transmitting the Paper marked No. 134. <i>a.</i> ⁽¹⁾ and remarking on the velocity of current in the Circular Canal, and its consequences.	Ditto ditto, ditto.
No. 134. <i>a.</i> ⁽¹⁾ Section of the Tides at High Water in the Circular Canal.	Ditto ditto, ditto.
No. 135. Minute dated 9th August 1833, by D. McFarlan, Esq. on the Papers marked No. 131. to No. 132. <i>a.</i> inclusive.	Ditto ditto, No. 26.
No. 136. Minute dated 18th August 1833, by Colonel J. Craigie on the Papers marked No. 133. No. 133. <i>a.</i> to No. 133. <i>a.</i> ⁽⁴⁾ inclusive.	Ditto ditto, No. 27.
No. 137. Letter from Superintending Engineer, L. P., dated 19th August 1833, to Secretary to Military Board, transmitting the Paper marked No. 137. <i>a.</i>	Ditto ditto, No. 28.
No. 137. <i>a.</i> Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 12th August 1833, to Superintending Engineer, L. P., stating the Establishment that is necessary for the working of the Lock Gate at Chitpore, and the amount of Toll which should be levied on Boats entering the Circular Canal.	Ditto ditto, No. 28 <i>a.</i>
No. 138. Letter from Military Board, dated 10th September 1833, to Governor General in Council, transmitting the Papers marked No. 131. No. 131. <i>a.</i> No. 133. No. 133. <i>a.</i> to No. 133. <i>a.</i> ⁽¹⁾ inclusive, and No. 134. No. 134. <i>a.</i> and No. 134. <i>a.</i> ⁽¹⁾ also No. 137. and No. 137. <i>a.</i>	Ditto ditto, No.
No. 139. Letter from Military Board, dated 10th September 1833, to Captain Thomson, Captain Fitzgerald and J. Prinsep, Esq., requesting them to form themselves into a Committee, and report on the construction of a Cess Pool, and the slope to be given to the banks of the Canal.	Ditto ditto, No.
No. 140. Letter from Military Board, dated 10th September 1833, No. 2198, to Superintending Engineer, L. P., in reply to his letter of 2d July last, marked No. 133.	Ditto ditto, No.
No. 141. Letter from Military Board, dated 10th September 1833, to J. Prinsep, Esq., requesting him to put Captain Thomson in	Ditto ditto, No.

possession of all the Plans and Drawings connected with the Canals, and that the Board think it desirable that Mr. Prinsep should retain charge of the Canal West of the Barrackpore Bridge, till the Locks and the Road to the Bridge are finished.

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| Military Board's
Proceedings, 17th
September 1833,
No. 42. | No. 142. Letter from Superintending Engineer, L. P., dated 27th July 1833, to Secretary to Military Board, transmitting a Bill amounting to Rs. 442, for clearing roots, &c. from the Mofussil Canals, from May to September 1832. |
| Ditto 27th Sept.
1833, No. 35. | No. 143. Letter from Superintending Engineer, L. P., dated 9th July 1833, to Secretary to Military Board, with advertence to Board's Letter of the 4th September last, transmits the Paper marked No. 143. a. |
| Ditto ditto, ditto. | No. 143. a. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 7th June 1833, to Superintending Engineer, L. P., transmitting a Bill for making Puckah the Road and Drains along the North side of the Intally Canal, from its junction with the Circular Canal to the mouth of the Dhurumtollah Drain, including a Road through the Wood Bazar to the Circular Road. |
| *Military Board's
Proceedings 27th
Sept. 1833. | No. 143½. * * * * * * * |
| Military Board's
Proceedings, 4th
Oct. 1833, No. 8. | No. 144. Letter from Secretary to Government, dated 24th September 1833, to the Military Board, in reply to their Letter No. 2202, of 10th instant, stating that the Government approves of the suggestions &c. relative to the present state and future management of the Circular and Mofussil Canals with reference to the Reports of the Superintending Engineer, L. P., and the Superintendent of Canals. |
| Ditto ditto, ditto. | No. 145. Letter from Secretary to Military Board, dated 4th October 1833, to Superintendent of Canals, stating that Government having called on the Sudder Board of Revenue to suggest arrangements for the Superintendence of the duties connected with the Tolls, and letting of the Land on the Banks of the Canal; he, the Superintendent, is requested to afford the Revenue Board such information as he may be able to give. .. |
| Ditto 1st Novem-
ber 1833, No. 9. | No. 146. Letter from Superintending Engineer, L. P., dated 18th October 1833, to Secretary to Military Board, transmitting the Paper marked No. 146. a. |

* NOTE.—Amongst the Proceedings of this day, are Papers relative to the Drainage of the Salt Water Lake, transmitted by the private Secretary to the Governor General, Lord W. C. Bentinck—Copies of these Papers have already been printed by the Committee. See Appendix G. page 1 to 29 inclusive. See also pages 30 to 57 of the same Appendix, where the Papers of the Military Board's Proceedings of 7th February 1834, on the same subject will be found printed.—J. M.

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- No. 146. *a.* Letter from Superintendent of Canals, dated 8th October 1833, to Superintending Engineer, L. P., submitting a proposition for building up the mouths of the General Cross Drains leading into the principal Drains between the Canal and Circular Road. Military Board's Proceedings, 1st November 1833, No. 10.
- No. 147. Letter from Superintending Engineer, L. P., dated 27th November 1833, to Secretary to Military Board, applying for an advance on account of repairing the Narculdangah and Manicktollah Suspension Bridges, and making Tow-paths along the Sunderbund Canal, and constructing the Drains to the New Puckah Road of the Circular Canal. Ditto 3rd December 1833, No. 29.
- No. 148. Letter from Superintending Engineer, L. P., Lieutenant Colonel R. Tickell, dated 16th October 1833, to Secretary to Military Board, transmitting the Paper marked No. 148. *a.* Ditto ditto, No. 35.
- No. 148. *a.* Report dated 8th October 1833, by J. Prinsep, Esq. Superintendent of Canals, on the accident that occurred to the Chitpore Lock Gate on 28th September instant. Ditto ditto, No. 36.
- No. 148. *a.*⁽¹⁾ Report by Overseer J. Bedford, on the accident to the Chitpore Lock Gate. Ditto ditto, ditto.
- No. 149. Letter from Secretary to Military Board, dated 25th Oct. 1833, to Superintendent of Canals, Captain J. Thomson, requesting him to report on the effect the admission of the current from the River, caused by the accident to the Chitpore Lock Gate on the 28th September instant, had on the Circular Canal. . . Ditto ditto, ditto.
- No. 150. Report dated 12th Nov. 1833, by the Superintendent of Canals, Captain J. Thomson, on the admission of the current from the River caused by the accident to the Chitpore Lock Gate. . . Ditto ditto, No. 37.
- No. 151. Letter from Secretary to Military Board, dated 3d December 1833, to Superintendent of Canals, stating, that if the Section of the Balliaghat Canal is not equal to that of the Circular Canal, it appears to the Board, that the clearing away of Bunds in the Circular Canal, and the removal of deposit in it ought to be contemporaneous with the widening and deepening of the Balliaghat Canal, and requests the opinion of the Superintendent on the above points. Ditto ditto, No. 38.
- No. 152. Letter dated 22d November 1833, from Superintendent of Canals, to Secretary to Military Board, in reply to his Letter of the 25th ultimo, marked No. 149. Ditto ditto, No. 39.
- No. 153. Letter from Military Board, dated 3d December 1833, No. 3479, to the Governor General in Council, transmitting the Papers marked No. 148. to No. 152. inclusive.

Military Board's Proceedings, 3rd December 1833, No.	No. 154. Letter from Secretary to Military Board, dated 3d December 1833, No. 3480, to Superintendent of Canals, authorizing the clearing of the Bunds in the Circular Canal, referred to in his Letter of the 22d November 1833, at an expense of Rs. 2,000, and requesting an Estimate of the expense of making the Section of the Balliaghat Canal equal to that of the Circular Canal.
Ditto 6th Decem- ber 1833, No. 10.	No. 155. Letter from Superintending Engineer, L. P., to Secretary to Military Board, dated 28th November 1833, reporting that Captain J. Thomson received charge of the Chitpore Locks and the West end of the Circular Canal from Mr. J. Prinsep on the 18th instant, and suggesting alterations in the windlasses for opening and shutting the Lock Gates.
Ditto 31st Decem- ber 1833, No. 7.	No. 156. Letter from Secretary to Government, dated 23d December 1833, to Military Board, authorizing an advance of Rs. 1,975, for excavating the Bed of the Circular Canal.
Ditto, 17th Janu- ary 1834, No. 22.	No. 157. Letter from Superintending Engineer, L. P., dated 28th December 1833, to Secretary to Military Board, transmitting the Paper marked No. 157. a.
Ditto ditto, No. 23.	No. 157. a. Statement of former, present, and proposed Establishments attached to the Canal and Iron Bridge Department, by Superintendent of Canals, dated 19th December 1833.
Ditto ditto, ditto.	No. 158. Letter from Secretary to Military Board, dated 17th January 1834, to Superintending Engineer, L. P., stating, that the Board approve of the Establishments fixed by the Superintendent in both the Departments under his charge.
Ditto, 7th February 1834, No. 58.	No. 159. Letter from Superintending Engineer, L. P., dated 23rd November 1833, to Secretary to Military Board, transmitting Mr. Prinsep's Bill for expense incurred on account of Grounds purchased from May to August 1833.
Ditto, 14th Febru- ary 1834, No. 34.	No. 160. Letter from Superintending Engineer, L. P., dated 28th December 1833, to Secretary to Military Board, transmitting the Paper marked No.
Ditto ditto, ditto.	No. 160. a. Letter from the Superintendent of Canals, dated 9th December 1833, to Superintending Engineer, L. P., transmitting, with reference to the Board's Letter of the 10th September 1833, an Estimate of the expense of constructing the Embankment, and executing the Basin referred to in the 19th and 20th paragraphs of his, the Superintendent's, Report on the Canals, and stating, that the effect of closing up the Nullahs and forming the Embankment, will be to cause a strong Current into the

Lake past Balliaghata, which will, in a few months, make a Channel 9 or 10 feet deep ; that it is not intended that all the Nullahs connecting the South-west Lake Channel should be closed up, because the proposed opening at Balliaghaut would be insufficient to drain the Lake of rain water. It is therefore proposed to close up the connecting Nullahs in succession, until a Current of 3 or 4 feet per second is got through the Channel at Balliaghata. The Current at present does not exceed 9 inches per second. If the Lake is at any future period Drained, the proposed tow-path will have to be raised $1\frac{1}{2}$ feet, at a very trifling expense, and no alteration whatever would probably be required to the proposed Basin and Docks.

No. 161. Letter from the Military Board, dated 14th February 1834, to the Vice President in Council, transmitting the Papers marked No. 160. and No. 160. a., and stating, that the Bunding work referred to in the Superintendent of Canals's Letter, will probably afford some criterion of the expense of the Bunding work that will be required in Draining the Salt Water Lakes, and may be considered the first step in that work. Lieut. Col. Galloway does not recommend this Estimate, because in the event of warping the Lake, the Bund-work estimated for, will not, in Col. G.'s opinion, be at all required, and refers to his Minute on the Draining of the Lake, submitted with the Board's Letter to Government of the 7th February 1834. ..

Military Board's
Proceedings, 14th
Feb. 1834, No.

No. 162. Letter from Superintending Engineer, L. P., dated 19th February 1834, to Secretary to Military Board, in reply to his Letter of the 3rd December 1833, to Superintendent of Canals, transmits a copy of the Paper marked No. 161. a.

Ditto 18th March
1834, No. 51.

No. 162. a. Letter from Superintendent of Canals, dated 16th January 1834, to Superintending Engineer, Lower Provinces, in reply to Secretary to Military Board's Letter of the 3rd December 1833, reports his having commenced digging out the Circular Canal to an uniform depth and width, and his having adopted measures for securing the Banks of the Canal near the Locks, and remarks on the value of rubble stone as the most certain and readiest means of protecting the banks and bottom of Water-courses, and suggests the expediency of having a large stock on hand ; also states, he will submit an Estimate of the expense of making the Section of the Balliaghat Canal equal to that of the Circular Canal, when his experience in digging out the latter will furnish him with correct data.

Ditto ditto, ditto.

No. 163. Letter from Secretary to Military Board, dated 18th March 1834, to Superintending Engineer, Lower Provinces, stating, that the Superintendent of Canals should advertize in the Exchange Gazette, that he will land stone Ballast at his own

Ditto ditto, ditto.

expense, and in the mean time furnish an Estimate of the expense of piling and procuring rubble stones from the vicinity of Rajmahal.

Military Board's
Proceedings, 21st
March 1834, No.
41.

No. 164. Letter from Superintending Engineer, L. P., dated 22nd February 1834, to Secretary to Military Board, transmits, with reference to the Board's Letter No. 4,393, of the 28th January 1834, the Paper marked No. 164. a.

Ditto ditto, ditto.

No. 164. a. Letter from Superintendent of Canals, dated 12th February 1834, to Superintending Engineer, L. P., transmitting Plan and Estimate for constructing a Cess Pool in the Entallee Canal, at the head of the Dhurumtollah Drain, and stating, that the height of the rivetment of the Cess Pool is determined by the highest rise of the water in the Canal, and not by the sill of the Dhurumtollah Drain.

Ditto ditto, No.

No. 165. Letter from Secretary to Military Board, dated 21st March 1834, to Superintending Engineer, L. P., stating, that the Board have doubts on that part of the Plan of Cess Pool at the head of the Dhurumtollah Drain by the Superintendent of Canals which proposes to raise the rivetment higher than the sill of the said Drain, the effect of which would be to cause on every occasion of heavy falls of rain, a back water, which would be objected to by the Calcutta Magistrates in the Conservancy Department, and requesting that the Board's remarks may be submitted to the Superintendent of Canals for his observations on the same.

Ditto, 6th May
1834, No. 43.

No. 166. Letter from Superintending Engineer, L. P., dated 19th April 1834, to Secretary to Military Board, transmits with reference to Board's Letter, No. 3,480, of 3rd December last, the Paper marked No. 166. a.

Ditto ditto, ditto.

No. 166. a. Letter from Superintendent of Canals, dated 17th March 1834, to Superintending Engineer, L. P., transmitting an Estimate for digging out the Balleaghatta Canal, and stating, that the Canal would have to be closed 72 days; at the same time expressing his opinion, that the work is not necessary, unless it is found that the water admitted from the Hooghly River is not capable of deepening and widening the Canal. ..

Ditto ditto, No.

No. 167. Letter from Secretary to Military Board, dated 6th May 1834, to Superintending Engineer, L. P., stating, that the Board cannot sanction the Superintendent of Canal's Estimate for excavating the Balliaghat Canal, until they know what effect his trial of scouring the Canals produces.

Ditto ditto, No. 36.

No. 168. Letter from G. A. Prinsep, Esq., dated 18th April 1834, to Secretary to Military Board, submitting a formal complaint of the

serious injury done to the Salt Works at Balliaghat, which he is carrying on under a contract with the Government, by an act of the Superintendent of Canals, in admitting the River Water through the Chitpore Lock Gates.

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| <p>No. 169. Letter from Superintendent of Canals, dated 19th April 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 15th instant, No. 5,799, reports that the Chitpore Lock Gates were opened on the 1st instant, to admit a current of water to scour the Circular Canal, and free it of the filth and stagnant brackish water in it.</p> | <p>Military Board's
Proceedings, 6th
May 1834, No. 37.</p> |
| <p>No. 170. Letter from Secretary to Military Board, dated 22nd April 1834, to Superintendent of Canals, transmitting the Paper marked No. 168, and requesting his remarks thereon.</p> | <p>Ditto ditto, No. 37.</p> |
| <p>No. 171. Letter from Superintendent of Canals, dated 25th April 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 22nd instant (marked No. 170,) transmits his observations on Mr. Prinsep's formal complaint.</p> | <p>Ditto ditto, No. 39.</p> |
| <p>No. 172. Letter from Secretary to Military Board, dated 6th May 1834, to Superintendent of Canals, stating that the restrictions as to lashing back the Chitpore Lock Gates are for the present withdrawn.</p> | <p>Ditto ditto, No. 37.</p> |
| <p>No. 173. Letter from Military Board, dated 6th May 1834, to the Honorable V. P. in Council, transmitting the Papers marked No. 168. and No. 171, and stating, that they are of opinion that Mr. Prinsep has no special cause for complaint.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 174. Letter from Secretary to Military Board, dated 6th May 1834, to G. Prinsep, Esq. stating in reply to his Letter of the 18th ultimo, (marked No. 168.) that the subject of his complaint has been submitted for the orders of Government, and in the interim the Superintendent of Canals has been directed to use his own discretion in opening and shutting the Chitpore Lock Gates.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 175. Letter from Superintending Engineer Lower Provinces, dated 11th March 1834, to Officiating Secretary to Military Board, with reference to the Secretary's Letter of the No. 4,675 of the 14th ultimo, transmits the Paper marked No. 175. a.</p> | <p>Ditto, 13th May
1834, No. 56.</p> |
| <p>No. 175. a. Letter from Superintendent of Canals, dated 4th March 1834, to Superintending Engineer Lower Provinces, transmitting a corrected copy of his Letter of the 9th September 1833, marked No. 175. a.⁽¹⁾ and reporting on the subject of the Drains of the Circular Canal.</p> | <p>Ditto ditto, ditto.</p> |

Military Board's
Proceedings, 13th
May 1834, No. 57.

No. 175. a.⁽¹⁾ Letter from Superintendent of Canals, dated 9th September 1833, to Superintending Engineer Lower Provinces, reporting the repairs done to the Banks of the Circular Canal, and suggesting a Plan of Drains along the Banks of the Canal. ..

Ditto ditto, No.

No. 176. Letter from Secretary to Military Board, dated 13th May 1834, to Superintending Engineer Lower Provinces, stating that the Board are not satisfied with the Superintendent's of Canals Plan of Drains along the Banks of the Circular Canal, and that Mr. Prinsep's Plan appears the most preferable, and if the apertures of his Drains are not large enough they might be made larger.

Ditto 20th May
1834, No. 20.

No. 177. Letter from G. A. Prinsep Esq., dated 17th May 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 6th instant, states, that it is of the greatest importance to the Salt Works that at the close of the season they should be deeply flooded with water of the greatest degree of Saltness procurable, the chief object of those works being the making every season supply brine for the first half of the next, when the Lake has little Salt in it, and hopes the Board will not object to ordering the Lock Gates to be closed for about three weeks, or a fortnight, till the commencement of the Rains, by which he will be enabled to make about 10,000 maunds of Salt. That with respect to the main question he, Mr. P., will address the Board of Customs, Salt and Opium, in order that its effects upon the interest of that Department may be duly brought to the notice of Government.

Ditto ditto, No. 21.

No. 178. Letter from G. A. Prinsep, Esq., dated 19th May 1834, to Secretary to Military Board, stating, that since he, Mr. P., had addressed the Secretary on the 17th instant, he has discovered that the Circular Canal Lock Gates were open on the 16th, 17th and 18th instant, and that the Tide was allowed to pass freely to and fro between the River and the Lake. This happening on the Neaps, did not produce any mischief, and which may not be removed by the Springs, if these are allowed access to the Lake only from the Soonderbunds Nullah; but if the same Plan of opening the Gates continue only two days longer when the Springs commence, the injury to the works will be very great, and requests the Board will allow the Gates to be closed till the 9th proximo.

Ditto ditto, No.

No. 179. Letter from Secretary to Military Board, dated 19th May 1834, to Superintendent of Canals, transmitting in original, Mr. G. A. Prinsep's Letter of the 17th instant, (marked No. 178.) and directing, under the Special circumstances of the case, that the Chitpore Locks Gates may be closed until the commencement of the Rains, or the middle of next month.

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- No. 180. Letter from Secretary to Military Board, dated 19th May 1834, to G. A. Prinsep, Esq., stating, that the Superintendent of Canals has been directed to keep the Chitpore Lock Gates closed, until the middle of next month.
 Military Board's Proceedings, 20th May 1834, No.
- No. 181. Letter from Superintendent of Canals, dated 10th May 1834, to Superintending Engineer, L. P., stating, that he has received from Mr. Prinsep, the whole of the Office Books of the Canal Department; and, with reference to his Letter of the 18th March instant, that it appears that information respecting the lands purchased for the Sunderbund Canals is lodged in the Collector's Office.
 Ditto 23rd May 1834, No. 30.
- No. 182. Letter from the Deputy Secretary to Government, dated 19th May 1834, to Military Board, in reply to their Letter of the 6th instant, stating, that the Honorable V. P. in Council approves of the instructions given to the Superintendent of Canals, with reference to the complaint preferred by Mr. G. A. Prinsep of the injury done to his Salt Works on the Salt Water Lake, by keeping open the Chitpore Lock Gate. ..
 Ditto 27th May 1834, No. 17.
- No. 183. Letter from Superintending Engineer, L. P., dated 13th June 1834, to Officiating Secretary to Military Board, transmitting the Papers marked No. 183. a. and No. 184. by which it will be seen, that it was never intended to lead the water from the Bank across the Roadway, and then back again under the Road; and states that the mode adopted by that Officer for Draining the Banks, is the best and simplest that could be followed.
 Ditto, 13th June 1834, No. 43.
- No. 183. a. Letter from Superintendent of Canals, dated 20th May 1834, to Superintending Engineer, L. P., transmitting the Section of the Canal Banks as they are now being formed, which also exhibits the surface Drainage along the side of the Road, and stating, that to have made Mr. Prinsep's Drains sufficiently large to have been cleaned out, would have cost more than two Lacks of Rupees.
 Ditto ditto, ditto.
- No. 184. Letter from Superintendent of Canals, dated 28th May 1834, to Superintending Engineer, L. P., transmitting the Section of the Drains of the Road on the West Bank of the Circular Canal, taken from the measurement of two of them, and remarking on the present state of them.
 Ditto ditto, ditto.
- No. 185. Letter from Superintending Engineer, Lower Provinces, dated 31st May 1834, to Officiating Secretary to Military Board's in reply to his Letter, No. 109. of the 6th instant, transmits the Papers marked No. 185. a. and No. 185. a.⁽¹⁾
 Ditto ditto, No. 44.

Military Board's Proceedings, 13th June 1834, No. 45.	No. 185. <i>a.</i> Letter dated 23rd May 1834, from Committee appointed to report on points connected with the Improvement of the Canal Department, as adverted to in Secretary to Military Board's Letter, No. 2,201, of 10th September last, (marked No. 139.)
Ditto ditto, ditto.	No. 185. <i>a.</i> (1) Separate Minute, dated 23rd May 1834, by a Member of the Committee, referred to in the Paper marked No. 185. <i>a.</i> dissenting from their views.
Ditto ditto, No.	No. 186. Letter from Officiating Secretary to Military Board, dated 13th June 1834, to Superintending Engineer, Lower Provinces, requesting him to call on the Superintendent of Canals, to submit an Estimate for a Cess Pool to be constructed for an experiment, the place where to be erected, and dimensions to be specified.
Ditto 27th June 1834, No. 49.	No. 187. Letter from Superintending Engineer, L. P., dated 9th June 1834, to Officiating Secretary to Military Board, applying for an advance of Sicca Rupees 6,000, on account of additional Works at the Chitpore Lock.
Ditto, 4th July 1834, No. 26.	No. 188. Letter from Superintending Engineer, L. P., dated 18th June 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 188. <i>a.</i> and No. 188. <i>b.</i>
Ditto ditto, ditto.	No. 188. <i>a.</i> Letter from Superintending Engineer, L. P., dated 31st May 1834, to Superintendent of Canals, stating, that the Military Board declines, in advertence to his Letter of the 17th March instant, to sanction his estimate for digging out the Balliaghaut Canal and sloping its Banks, until they know what effect the experiment of scouring the Canal might produce, and requesting him when that effect is known, to report on that point.
Ditto ditto, ditto.	No. 188. <i>b.</i> Letter from Superintendent of Canals, dated 10th June 1834, to Superintending Engineer, L. P., with reference to the Paper marked No. 188. <i>a.</i> reports on the state of the Balliaghaut Canal, and submits his suggestions for its improvement; and stating that the Current admitted from the Hooghly has had as yet, no material effect in deepening the Canal.
Ditto, 22nd July 1834, No. 7.	No. 189. Letter from Secretary to Government, dated 14th July 1834, to Military Board, transmitting the Papers marked No. 189. <i>a.</i> and No. 189. <i>b.</i> , and requesting that the Superintendent of Canals may be directed to state what objections he may have to offer to the proposition submitted by Mr. George Prinsep.

- No. 189. *a.* Letter from the Board of Customs, Salt and Opium, dated 5th July 1834, to the Honorable V. P. in Council, transmitting the Paper marked No. 189. *a.*⁽¹⁾
 Military Board's Proceedings, 22nd July 1834, No. 7.
- No. 189. *a.*⁽¹⁾ Letter from G. A. Prinsep, Esq., dated 2nd July 1834, to the Officiating Secretary to the Board of Customs, Salt and Opium, replying to the Board's Letter of the 25th ultimo, in which was conveyed a copy of a Letter from Mr. Secretary Prinsep, expressing the wish of Government to be informed in what manner the opening and shutting the Lock Gates at Chitpore might be regulated, so as not to interfere with, and even to benefit the Salt Works at Balliaghaut, upon which subject Mr. P.'s opinion is desired.
 Ditto ditto, ditto.
- No. 190 Letter from Secretary to Military Board, dated 22nd July 1834, to Superintendent of Canals, transmitting a Copy of a Paper marked No. 189. *a.*⁽¹⁾, and requesting him to state any objections he may have to offer to the proposition submitted by Mr. George Prinsep.
 Ditto ditto, ditto.
- No. 191. Letter, dated 18th July 1834, from Captain Thomson, Superintendent of Canals, to Secretary to Military Board, transmitting the Paper marked No. 191. *a.* and stating that in measuring the Section's, inaccuracies in the Plans and Reports of the ground belonging to this Canal were detected; the original breadth of ground said to have been purchased for the Canal was 150 feet, whereas on reference to the Field Book of the Survey, it appears to have varied from 155 to 170 feet. ..
 Ditto 5th August 1834, No. 51.
- No. 191. *a.* Five Sections of the Balliaghatta Canal.
- No. 191. *b.* Revised Estimate by the Superintendent of Canals, of the probable expense of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same Section as the Circular Canal, viz. 72 feet wide at Zero, and 30 feet at bottom, with a depth of 7 feet, and the Banks above water with a slope of 2 to 1, amounting, after correction, to Sicca Rupees 6,850 : 14. (See Board's Proceedings, 6th May and 4th July last).
- No. 192. Letter from Superintendent of Canals, dated 23rd July 1834, to Secretary to Military Board, stating, that he omitted in his Letter of the 18th instant to mention, that no injury would accrue to private property by the alteration suggested to the Banks of the Balliaghatta Canal.
 Ditto ditto, No. 52.
- No. 193. Letter from Secretary to Military Board, dated 5th August 1834, to Superintendent of Canals, stating, that as the shutting up the Entally and Circular Canals for so long a period

as 2½ or 3 months would have the effect of destroying the confidence of the holders of ground on the sides of the Canal, the Board will postpone the measure referred to in the Paper marked No. 192, till another year.

Military Board's
Proceedings, 15th
August 1834, No.

No. 194. Minute by the Chief Magistrate, regarding the Tolls on the Circular Canal.

Ditto ditto, ditto.

No. 195. Letter from Secretary to Military Board, dated 25th July 1834, to the Secretary of the Revenue Board, stating, that a considerable quantity of fire-wood is brought from Bhowanypore, on the Banks of Tolly's Nullah, to Narkuldangah, on the Circular Canal, by land, and requesting them to take into their consideration, how far this singular result may be attributable to the existence of a double place of receipt of Toll on the Circular Canal.

Ditto ditto, ditto.

No. 196. Statement of the Collections of Tolls of the New Circular Canal, amounting for the year 1831, to Rs. 106:4:3;—for 1832, Rs. 1,027:0:8;—for 1833, Rs. 1,213:12:3;—for 1834, from January to June, Rs. 352:13:9.

Ditto ditto, ditto.

No. 197. Letter from Secretary to Military Board, dated 27th July 1834, to Captain J. Thomson, informing him that Sumboonauth Ghosaul is the farmer of the fishery of the Circular Canal, at an annual rent of Rs. 271.

Ditto ditto, No 50.

No. 198. Letter from Superintendent of Canals, dated 26th July 1834, to Officiating Secretary to Military Board, states, with reference to the Paper marked No. 189. a.⁽¹⁾, the objections that exist against Mr. G. Prinsep's propositions regarding the management of the Circular Canal Lock Gates.

Ditto ditto, ditto

No. 199. Letter from Secretary to Military Board, dated 15th August 1834, No. 1,904, to Superintendent of Canals, in reply to his Letter marked No. 198., requests him to furnish a specific detail of the plan of operation he would propose to adopt as essential to the complete economical management of the Canal, stating the time he would propose to admit a current, and the strength of it, and the period when the Lock Gates might be lashed back.

Ditto, 22nd August
1834, No. 37.

No. 200. Letter from Superintendent of Canals, dated 26th June 1834, to Superintending Engineer, L. P., stating his reasons for not submitting an Estimate for a Cess Pool until the level of the bottom of the Drain, at the mouth of which it is to be formed, is finally determined upon.

Ditto ditto, No.

No. 201. Letter from Secretary to Military Board, dated 5th August 1834, to Superintendent of Canals, with reference to the Paper

marked No. 200. requests explanation respecting the high and low water levels in the Circular Canal being fixed and known ; and stating that the alteration of the levels of the mouths of the Drains cannot be calculated on, as it would be more advisable they should be lowered than raised.

- No. 202. Letter from Superintendent of Canals, dated 9th August 1834, to Secretary to Military Board, stating, that he cannot at present state, what the high and low water levels in the Circular Canal will be on any day of the year ; that as the levels of the mouths of the Drains running into the Circular Canal are not to be altered, the proposition of having Cess Pools is of course impracticable ; and the propositions of the Committee, of which Col. Wood, Engineers, was President, are the only resources now left for the removal of the filth brought into the Canal.

Military Board's
Proceedings, 22nd
August 1834, No.
40.

- No. 203. Letter from Superintendent of Canals, dated 7th August 1834, to Secretary to Military Board, proposing as a saving of expense, and preventing the necessity of closing the Canal, to deepen the Balliaghatta Canal by Steam Dredgers ; and requesting authority being granted him to regulate the Boats in the Canals ; that the experience of the past year has shewn, that the Magistrate of the 24-Pergunnahs has not the power either to preserve the Navigation open, prevent injury to the Banks, or guard against the daily wreck of Boats.

Ditto, 26th August
1834, No. 30.

- No. 204. Letter from Secretary to Military Board, dated 26th August 1834, to Superintendent of Canals, approving the use of the Dredging Boat as proposed, and requesting him to state in what manner he wishes to exercise the authority to regulate the Boats in the Canals.

Ditto ditto, No.

- No. 205. Letter from Secretary to Military Board, dated 3rd May 1833, to Superintending Engineer, L. P., directing his attention to the annual report on Canal operations during 1831 and 1832, and stating that the duties that now devolve on the Superintendent of Canals is to maintain the Canals in a state of efficiency, and to recommend every measure which science or ingenuity may suggest of rendering the Canals as extensively useful to the Public and productive to Government as possible ; and that the Superintendent be requested to report on the several suggestions by Mr. Prinsep, relative to encroachments on Government Lands, &c.

Ditto 9th September
1834, No.

- No. 206. Letter from Superintendent of Canals, dated 2nd of August 1834, to Secretary to Military Board, with reference to Board's Letter of the 3rd May 1833, (marked No. 205.) on the subject of the efficient protection of the Government Lands on the Banks of the Circular Canal from encroachments, and also of

Ditto ditto, No. 22.

Mr. Prinsep's proposal of Registering the lots, suggests that the proposed Registry be kept on the American Plan. . . .

Military Board's
Proceedings, 9th
Sept. 1834, No. 22.

No. 207. Letter from Secretary to Military Board, dated 9th September 1834, to Superintendent of Canals, stating that there are already Plan and Register of the Lands along the Circular Canal with the Chief Magistrate, which supersede the necessity of any other Register or Plan. . . .

Ditto, 12th Sept.
1834, No. 12.

No. 208. Letter from Superintendent of Canals, dated 4th September 1834, to Secretary to Military Board, stating, with reference to the Board's Letter of the 26th of August last (marked No. 204.) the nature of the authority required by him to regulate the Boats in the Balliaghatah Canal. . . .

Ditto ditto, ditto.

No. 209. Letter from Secretary to Military Board, dated 12th September 1834, to Superintendent of Canals, stating, that nothing effectual can be done regarding the regulation of Boats in the Balliaghaut Canal without the formation of a Basin, as already proposed, and in the meantime refers him to the Magistrate and Collector of the 24-Pergunnahs, for such authority as may be in their power to grant. . . .

Ditto, 23rd Sept.
1834, No. 61.

No. 210. Letter from Superintendent of Canals, dated 15th September 1834, to Secretary to Military Board, stating, with reference to his Bill No. 5, that the mud dug out of the Circular Canal was equal to the average quantity deposited in two years; that the Canal can be dug out every second year for Rs. 4,700, independently of the expense and inconvenience of closing the Circular Canal. . . .

Ditto ditto, No.

No. 211. Letter from Military Board, dated 23rd September 1834, to the Honorable V. P. in Council, transmitting with remarks, the Bill of the Superintendent of Canals for excavating the bed of the Circular Canal, which has exceeded the Estimate by Rs. 2,950.

Ditto, 26th Sept.
1834, No. 29.

No. 212. Letter from Superintending Engineer, L. P., dated 17th May 1834, to Secretary to Military Board, transmitting the Paper marked No. 212. a. . . .

Ditto ditto, No. 30.

No. 212. a. Letter from J. Prinsep, Esq., dated 15th March 1834, to Superintending Engineer, L. P., reporting on the Canal operations of 1832-33, and transmitting Bills and other Documents connected therewith, and apologizing for having so long delayed reporting the final transfer of his duties to his successor. . .

Ditto ditto, No. 32.

No. 213. Letter from Superintending Engineer, L. P., dated 26th September 1834, to Secretary to Military Board, transmitting Mr. Prinsep's Plan of the Lock Gates at Chitpore. . . .

No. 214. Letter from Superintending Engineer, L. P., dated 11th June 1834, to Secretary to Military Board, transmitting the Paper marked No. 214. a.	Military Board's Proceedings, 26th September 1834, No. 33.
No. 214. a. Report on the Circular Canal Excavation and the Lock Gates at Chitpore, by the Committee of Survey.	Ditto ditto, ditto.
No. 215. Letter from Superintending Engineer, Lower Provinces, dated 31st May 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 215. a., and stating, that he has requested the Superintendent of Canals to furnish an Estimate of the Apparatus adverted to, for working the Lock Dams at the Chitpore Locks.	Ditto, 7th October 1834, No. 31.
No. 215. a. Report from Superintendent of Canals, dated 10th May 1834, to Superintending Engineer, Lower Provinces, on the present state of the Canal Works, and means of improving them. . .	Ditto ditto, ditto.
No. 216. Letter from the Collector of Calcutta, dated 11th August 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 216. a.	Ditto ditto, No. 32.
No. 216. a. Statement exhibiting the Receipt of the amount of Tolls at the Chowkee on the New Circular and Entallee Canals. . .	Ditto ditto, No.
No. 217. Letter from Officiating Secretary to Military Board, dated 28th August 1834, to Superintendent of Canals, requesting to be furnished with the number of Boats that have been passed through the Lock Gates monthly, since the date of its being last opened.	Ditto ditto, ditto.
No. 218. Letter from Superintendent of Canals, dated 29th August 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 218. a.	Ditto ditto, No. 33.
No. 218. a. Table, shewing the number of Boats that have passed through the Chitpore Locks, from 19th March to 28th August 1834, inclusive.	Ditto ditto, ditto.
No. 219. Letter from the Military Board, dated 12th September 1834, to the Vice President in Council, transmitting with the opinions of the Board thereon, the Papers marked No. 215. and No. 215. a.	Ditto ditto, No. 34.
No. 220. Letter from Secretary to Government, dated 29th September 1834, to Military Board, in reply to their Letter of the 12th September instant, sanctions the Disbursement of a sum not exceeding Rs. 1,500 for the purpose of removing sunken Boats from the Canals, and repairing and improving the length of	Ditto ditto, No. 35.

the Tow-paths, and stating, that the general question discussed in Colonel Galloway's Minutes will be reserved for future consideration.

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| Military Board's Proceedings, 7th October 1834. | No. 221. Letter from Officiating Secretary to Military Board, No. 2871, dated 7th October 1834, to Superintending Engineer, Lower Provinces, transmitting an Extract (Paragraph 2nd) of the Paper marked No. 220. |
| Ditto, 28th October 1834, No. 2. | No. 222. Letter from Secretary to Government, dated 13th October 1834, to Military Board, stating that the Bill of the Superintendent of Canals referred to in the Paper marked No. 211, has been passed. |
| Ditto, 4th November 1834, No. 2. | No. 223. Letter from Secretary to Government, dated 20th of October 1834, to Military Board, stating that the Bills, referred to in the Paper marked No. 212. a. has been passed. |
| Ditto, 19th December 1834, No. 37. | No. 224. Letter from Superintendent of Canals, dated 19th November 1834, to Superintending Engineer, replying to his Letter of the 10th May last, relative to forming Embankments and Tow-paths on the Lake Channel. |
| Ditto ditto, ditto. | No. 225. Letter from Secretary to Military Board, dated 19th December 1834, to Superintendent of Canals, requesting him to furnish a detailed Estimate for forming the Tow-paths, &c. referred to in the Paper marked No. 224. |
| Ditto, 6th January 1835, No. 49. | No. 226. Letter from Superintendent of Canals, dated 8th November 1834, to the Superintending Engineer, L. P. reporting that 200 yards of the South Bank of Entallee Canal West of the Coolya Bridge, as might have been anticipated, has slid into the Canal, and stating that measures for the prevention of which have not yet been authorized. |
| Ditto ditto, ditto. | No. 227. Letter from Superintendent of Canals, dated 19th November 1834, to the Superintending Engineer, L. P., stating that the measures for preventing the sliding of the Banks of the Entallee Canal are, increasing the Slope of the Bank to 2 of base to 1 in height, and regulating the manner of fastening the Boats in the Canal, but that to remedy the injury caused by the sliding of the Bank would be inexpedient, as the expense would far exceed the benefit likely to result therefrom. |
| Ditto ditto, No. 45. | No. 228. Letter from Superintendent of Canals, dated 30th October 1834, to the Superintending Engineer, L. P., stating that at the conclusion of the rains the sediment brought into the Circular Canal this season is more than twice as much as the yearly average; that the quantity deposited by the Narcoledangah Drain alone is 2,13,000 cubic feet, and by the other Drains in |

proportion ; that the least depth of water at Narcoledangah is 1 feet 8 inches, Manicktullah 2 feet 6 inches, and Nunddunbaugan Drain 2 feet 2 inches ; that the height of the River Hoogly is at present 7 feet above the average level ; and that he cannot expect to be able to open the Chitpore Lock Gates before the end of November, when by this latter means he expects to succeed in deepening the Canal about 2 feet ; but as the Salt Water Lake falls a foot below Zero in the cold season, there would remain only 2 feet 6 inches of water in the Canal, which will prevent heavy loaded Boats from passing through it.

No. 229. Letter from Secretary to Military Board, dated 25th November 1834, to the Superintending Engineer, L. P., requesting him to call upon the Superintendent of Canals to explain the data by which he arrives at his conclusion, relative to the quantity of sediment deposited by the Calcutta Drains.

Military Board's
Proceedings, 6th
January 1835, No.
46.

No. 230. Letter from Superintendent of Canals, dated 28th November 1834, to Superintending Engineer, L. P., stating that the annual average quantity of sediment from each of the Calcutta Drains is about 90,000 cubic feet, ascertained by the quantity dug out of the Entallee Canal, and what was dredged and dug out of the Circular Canal ; that Colonel Wood's Committee on Mr. James Prinsep's information, assumed the above quantity, and reported it to the Military Board with their reasons for their opinion ; that he, the Superintendent's experience, has not induced him to make any alteration on this assumed fact ; and stating the manner the quantity of sediment deposited by the Narcoledangah Drain, and the quantity of rain that fell on the 1st of June to 31st of October, have been ascertained. .

Ditto ditto, No. 47.

No. 231. Letter from Superintending Engineer, L. P., dated 9th December 1834, to the Officiating Secretary to Military Board, transmitting a sketch by the Superintendent of Canals, of the effect the Nacoledangah Drain has on the depth of the Circular Canal, shewing also that the effect of opening the Lock Gates has increased the depth at the Narcoledangah Bridge 2 feet, as was anticipated.

Ditto ditto, No. 48.

No. 232. Letter from Military Board, dated 6th January 1835, to the Governor General of India in Council, in continuation of their Letter No. 2662, of the 23rd September last, transmits the Paper marked No. 228. and No. 231. with observations thereon.

Ditto ditto, No.

No. 233. Letter from Superintendent of Canals, dated 8th November 1834, to Superintending Engineer, L. P., relative to the repairs of the Dredging Boat and constructing of Mud Boats. ..

Ditto, 9th January
1835, No. 46.

Military Board's Proceedings, 23rd January 1835, No. 71.	No. 234. Letter from Superintendent of Canals, dated 8th November 1834, to Superintending Engineer, L. P., reporting on the state of the Pucka Road on the Western Bank of the Circular Canal.
Ditto ditto, No.	No. 235. Letter from Superintending Engineer, L. P., dated 9th December 1834, to Officiating Secretary to Military Board, transmitting an Estimate amounting to Sicca Rupees 3,004 : 1 : 11, by the Superintendent of Canals, for repairing the Pucka Road on the Western Bank of the Circular Canal.
Ditto ditto, No.	No. 236. Letter from Military Board, dated 23rd January 1835, to Governor General in Council, transmitting the Paper marked No. 234. and the Estimate referred to in the Paper marked No. 235. and stating, that in the opinion of the Board a Toll might be levied on the Road above referred to.
Ditto, 3rd February 1835, No. 30.	No. 237. Letter from Superintendent of Canals, dated 20th August 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 15th August 1834, No. 1904. transmits the Paper marked No. 237. a., and states the Plan of Operations he would recommend for carrying into effect, with economy and regard to private interests, the objects referred to by the Board relative to the Circular Canal.
Ditto ditto, No.	No. 237. a. Table of Tides in the River Hooghly, by the Superintendent of Canals.
Ditto ditto, No.	No. 238. Letter from Superintendent of Canals, dated 5th September 1834, to Secretary to Military Board, remarking on the effects of the Tides on the water in the Circular Canal.
Ditto ditto, No.	No. 239. Letter from Officiating Secretary to Military Board, dated 9th September 1834, to G. A. Prinsep, Esq., transmitting the Paper marked No. 237. and requesting his opinion on the same.
Ditto ditto, No. 31.	No. 240. Letter from G. A. Prinsep, Esq., dated 16th September 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 9th instant, offers his opinion on the management of the Chitpore Lock Gates with reference to his Salt Works at Balliaghatta.
Ditto ditto, No.	No. 241. Letter from Secretary to Military Board, dated 3rd October 1834, to Superintending Engineer, L. P., transmitting the Papers marked No. 237. and No. 240. and requesting his observations on the same.
Ditto ditto, No. 32.	No. 242. Letter from Superintending Engineer, L. P., dated 20th October 1834, to Officiating Secretary to Military Board, in reply to

his Letter of the 3rd instant marked No. 241. states, that the measures proposed by the Superintendent of Canals appear to be well adapted for attaining the objects desired, and that Mr. Prinsep has no just grounds for complaint of injury being done to his Salt Works.

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| <p>No. 243. Letter from Military Board, dated 11th November 1834, to the Vice-President in Council, with reference to the Letter of the Secretary to Government of 14th July last, marked No. 189, transmits the Papers marked No. 198. No. 199. No. 237. No. 237. a. No. 240. and No. 242.</p> | <p>Military Board's
Proceedings, 3rd
February 1835,
No. 33.</p> |
| <p>No. 244. Letter from Secretary to Government, dated 12th January 1835, to Military Board, replying to their Letter of the 11th November 1834, marked No. 243, on the management of the Chitpore Locks, with reference to the injury likely to be done to the experimental Salt Works at Balliaghatta.</p> | <p>Ditto ditto, No. 34</p> |
| <p>No. 245. Petition of Parbutty Daby, requesting to hire several parcels of Land on the Banks of the New Eastern Canal, for the purpose of Cultivation.</p> | <p>Ditto, 10th Fe-
bruary 1835, No.
70.</p> |
| <p>No. 246. Letter from Secretary to Military Board, dated 20th January 1835, to Superintendent of Canals, transmitting the Paper marked No. 245.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 247. Letter from Superintendent of Canals, dated 23rd January 1835, to Secretary to Military Board, stating, that it would be an advantage to let out the lands on the Banks of the Sundurbun Canals, for the purposes of Cultivation and erecting Bazars. . .</p> | <p>Ditto ditto, No. 71.</p> |
| <p>No. 248. Letter from Officiating Secretary to Military Board, dated 31st January 1835, No. 4962, to Superintendent of Canals, transmitting extract of the Paper marked No. 244.</p> | <p>Ditto ditto, No. 75.</p> |
| <p>No. 249. Letter from Secretary to Military Board, dated 10th February 1835, to Superintendent of Canals, replying to his Letter marked No. 247.</p> | <p>Ditto ditto, No. 72.</p> |
| <p>No. 250. Letter from Superintendent of Canals, dated 23rd December 1834, to the Superintending Engineer, L. P., requesting instructions relative to the Cutting the Jungle between the Embankment of Land and the Navigable Channels in the Soondurbuns, and complaining of the Embankments of the Soondurbun Canals having been Cut through to allow the water to run off the adjacent land, and to catch fish. ...</p> | <p>Ditto, 24th Fe-
bruary 1835, No.
57.</p> |
| <p>No. 251. Letter from Secretary to Military Board, dated 24th February 1835, to Superintending Engineer, L. P., requesting him to</p> | <p>Ditto ditto, ditto.</p> |

call on the Superintendent of Canals, for an Estimate of the probable cost of Cutting the Jungle referred to in his Letter, (marked No. 250,) and stating that the Superintendent of Canals makes no mention of a sum of Rs. 1,500 having already been sanctioned by Government for Cutting Jungle, &c., as communicated in the Board's Letter. No. 2871, of the 7th October 1834, marked No. 221.

Military Board's
Proceedings, 3rd
March 1835, No.
19.

No. 252. Letter from Superintendent of Canals, dated 2nd February 1835, to Officiating Secretary to Military Board, with reference to his Letter of the 31st ultimo. (marked No. 248.) states, that he knows of no method of preventing the Canals silting up, except by keeping the Lock Gates at Chitpore open at all times that may be practicable, and which is necessary for the preservation of the health of those residing near a stagnant Canal; and stating that a convenient mode of improving Mr. Prinsep's Salt Works at Balliaghatta, would be, by making a Cut connecting the brine fields with the Byah Nullah, and cutting off all connection with the Canal.

Ditto ditto, No. 42. No. 253. Letter from Superintendent of Canals, dated 27th February 1835, to Secretary to Military Board, in reply to his Letter of the 10th instant, marked No. 249. states, that the ground on the Banks of the Soonderbund Canals which is available for being rented was covered, with the earth which was excavated from the Canal; that his being able to collect the rents at an expense not exceeding the amount of them, will depend on the authority granted him for that purpose.

Ditto ditto, No. . No. 251. Letter from Secretary to Military Board, dated 3rd March 1835, to Superintendent of Canals, authorizing him to rent the ground on the Banks of the Soondurbun Canals in lots, according to his discretion.

Ditto ditto, No. No. 254 $\frac{1}{2}$. Letter from Military Board, dated 3rd March 1835, No. 5539, to the Governor General of India in Council, transmitting, with observations, the Papers marked No. 254 $\frac{1}{2}$, a. and No. 254 $\frac{1}{2}$, b.

Ditto ditto, No. No. 254 $\frac{1}{2}$, a. Estimate by the Superintendent of Canals, of the probable expense of making Tow-paths on the Salt Water Lake, amounting to Co's. Rs. 3,275.

Ditto ditto, No. No. 254 $\frac{1}{2}$, b. Estimate by the Superintendent of Canals, of the probable expense of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same section as the Circular Canal; viz. 72 feet wide at Zero, 30 feet deep, and reducing the height of the Banks, and making them to a slope of 2 to 1, amounting to Co's. Rs. 5,000.

- No. 255. Letter from Superintendent of Canals, dated 20th December 1834, to the Superintending Engineer, L. P., transmitting two Estimates ; viz. one for digging out the Entallee Canal Westward from Coolya Bridge, amounting to Rs. 3281 : 11 : 0 and the other for clearing out the Cess Pool of the Dhurumtollah Drain, amounting to Rs. 547 : 8 : 0 : and stating that Boats cannot approach the Cess Pool to take away its contents owing to the shallowness of the Canal.
- Military Board's
Proceedings, 10th
March 1835, No. 75.
- No. 256. Letter from Secretary to Military Board, dated 24th February 1835, to Superintendent of Canals, requesting to be informed if a partial removal of the obstructions in the Entallee Canal, which at present prevent Boats from approaching the Cess Pool, might not be made, instead of incurring the heavy expense proposed by the Superintendent.
- Ditto ditto, No. 76.
- No. 257. Letter from Superintendent of Canals, dated 27th February 1835, to the Secretary to Military Board, in reply to his Letter marked No. 256. states, that the partial removal of the obstructions at the head of the Entallee Canal, cannot be effected at a moderate expense
- Ditto ditto, No. 77.
- No. 258. Letter from Military Board, dated 10th March, 1835, to the Governor General of India in Council, transmitting the Papers marked No. 255. and No. 257. and recommending that the Estimates referred to in the former Paper, be sanctioned.
- Ditto ditto, No.
- No. 259. Letter from Superintendent of Canals, dated 19th February 1835, to Secretary to Military Board, requesting permission to make 4 or 5 Lacks of Bricks, for repairing the Road on the bank of the Circular Canal, and recommending that the Road be paved with Bricks instead of Khoah as being cheaper, smoother, and more easily repaired.
- Ditto, 13th March
1835, No. 15.
- No. 260. Letter from Secretary to Military Board, dated 13th March 1835, to Superintendent of Canals, authorizing him to make the Bricks referred to in his Letter, marked No. 259...
- Ditto ditto, No. 16.
- No. 261. Letter from Secretary to Government, dated 24th March 1835, to Military Board, stating, that the Estimate for clearing out the Dhurumtollah Cess Pool is sanctioned ; that in respect to the Estimate for clearing out the Canal, further information is required ; and requesting an Estimate of the expense of the partial clearing the Canal may be furnished.
- Ditto, 27th March
1835, No. 11.
- No. 262. Letter from Superintendent of Canals, dated 2nd March 1835, to Secretary to Military Board, transmitting a Plan and Estimate for an improved mode of working the Paddle Sluices of the Chitpore Locks.
- Ditto, 7th April
1835, No. 42.

- Military Board's
Proceedings, 7th
April 1835, No. 12.
- No. 263. Letter from Military Board, dated 7th April 1835, to Governor General of India in Council, transmitting the Paper marked No. 262. and recommending that the Estimate therein referred to be sanctioned.
- Ditto, 10th April
1835, No. 10.
- No. 264. Letter from Secretary to Government, dated 28th March 1835, to Military Board, transmitting the Paper marked No. 264. *a*.
- Ditto ditto, No.
- No. 264. *a*. Letter in Original, from the Secretary to the Sudder Board of Revenue, dated 13th March 1835, on the subject of the shallowness of Tolley's Nullah, and the employment of the Dredging Steam Engine to deepen the Channel.
- Ditto ditto, No. 5.
- No. 265. Letter from Secretary to Government, dated 4th April 1835, to Military Board, stating, that the Bill of the Superintendent of Canals, amounting after correction, to Rs. 3,027 : 6 : 7, for making 8 Windlasses, and completing and repairing the Lock Gates at Chitpore, has been passed.
- Ditto ditto, No. 20.
- No. 266. Letter from G. A. Prinsep, Esq. dated 8th April 1835, to Secretary to Military Board, transmitting the Paper marked No. 266. *a*. and stating that if the Superintendent of Canals carries his intention referred to in his Letter, into effect, it will be attended with very serious injury to the Ballaghaut Salt Works, and begging that the Superintendent be directed to defer the opening the Lock Gates till some time after the second week in June, should he then require the free current of the River for any purpose essential to the interests of the Canal...
- Ditto ditto, No.
- No. 266. *a*. Letter from Superintendent of Canals, dated --- to G. A. Prinsep Esq. apprising him of his, the Superintendent's, intention of opening the Chitpore Lock Gates.
- Ditto ditto, No. 11.
- No. 267. Letter from Military Board, dated 10th April 1835, to Superintendent of Canals, transmitting a copy of the Paper marked No. 264. *a*. and requesting his sentiments thereon.
- Ditto ditto, No. 21.
- No. 268. Letter from Secretary to Military Board, dated 10th April 1835, to Superintendent of Canals, stating, that it appears that he has not attended to the orders of Government, communicated in the Secretary's Letter, No. 4962, of the 31st January last, (marked No. 248.) which requires that due notice be given to Mr. Prinsep of any intention of opening the Chitpore Lock Gates; the notice of one day given by the Superintendent is not considered by the Board as sufficient, and they request, that he may keep the Lock Gates closed, and re-open them a week hence, should he not in the interim receive further instructions; and requesting him to explain, why it is necessary to keep the Locks open for six weeks?

- No. 269. Letter from Secretary to Military Board, dated 10th April 1835, to G. A. Prinsep, Esq., in reply to his Letter, marked No. 266. transmits a Copy of the Paper, marked No. 268.
- Military Board's
Proceedings, 10th
April 1835, No.
- No. 270. Letter from Superintendent of Canals, dated 4th April 1835, to Secretary to Military Board, in reply to his Letter, No. 6194, of the 27th March last, states, that the Dhurumtullah Cess Pool cannot be dug out until December next, and points out the necessity of digging out the Entallee Canal.
- Ditto, 28th April
1835, No. 48.
- No. 271. Letter from Secretary to Military Board, dated 14th April 1835, to Superintendent of Canals, with reference to his Letter of the 29th August 1834, (marked No. 218.) requests him to furnish a Statement of the number of Boats passed through the Chitpore Locks, from the 28th August 1834 to 1st of April 1835.
- Ditto ditto, No.
- No. 272. Letter from Secretary to Military Board, dated 14th April 1835, to the Collector of Calcutta, with reference to his Letter of the 11th August 1834, (marked No. 216.) requests him to furnish a Statement of the receipts of Tolls at the Chowkees on the Circular and Entallee Canals, from the 1st July 1834 to 1st April 1835.
- Ditto ditto, No.
- No. 273. Letter from the Military Board, dated 28th April 1835, to the Governor of Bengal, with reference to the Paper marked No. 267, transmits the Paper marked No. 270, with observations thereon.
- Ditto ditto, No.
- No. 274. Letter from Superintendent of Canals, dated 18th April 1835, to Secretary to Military Board, in reply to his Letter of the 10th instant, No. 6,428, reports on the Dredging out the Sand-bank in Tolley's Nullah, at the mouth of the Kamapookerya Nullah, and on the Nullah generally.
- Ditto 1st May 1835,
No. 17.
- No. 275. Letter from Secretary to Military Board, dated 1st May 1835, No. 6614, to Superintending Engineer, L. P., transmitting the Papers marked No. 274, and requesting his opinion on the subject of employing the Steam Dredger to deepen Tolley's Nullah.
- Ditto ditto, No. 18.
- No. 276. Letter from Military Board, dated 1st May 1835, to Secretary to Sudder Board of Revenue, in reply to his Letter of the 13th March last, (marked No. 264. a.) to the address of Mr. Secretary Macnaghten, states, that by the inquiries they have made on the subject of the above letter, they are of opinion that the Dredging Machine is neither the best, nor cheapest means of removing the obstruction that exists in Tolley's Nullah.
- Ditto ditto, No. 20.

- Military Board's
Proceedings, 1st
May 1835, No. No. 277. Letter from Military Board, dated 1st May 1835, to the Governor of Bengal, in reply to Mr. Secretary Mangles' Letter, No. 448 of the 28th March, on the subject of removing a Sand-bank from Tolley's Nullah.
- Ditto, 12th May
1835, No. 53. No. 278. Letter from Superintendent of Canals, dated 23rd April 1835, to Superintending Engineer, L. P., stating his right or otherwise to Cut the Jungle on the Banks of the Soonderbund Canals, to permit tracking along them, &c.
- Ditto ditto, No. 5. No. 279. Letter from Secretary to Government, dated 5th May 1835, to Military Board, in reply to their Letter of the 28th ultimo, states, that the Honorable the Governor of Bengal approves of their proposition to suspend the clearing out the Cess Pool sanctioned on the 24th March last, and of excavating the Intallee Canal, and requests that the Estimate for Rs. 547 : 8 : 0, sanctioned on the above date, may be cancelled.
- Ditto 19th May
1835, No. No. 280. Letter from Military Board, dated 19th May 1835, to the Governor of Bengal, with reference to the 5th Paragraph of their Letter of the 10th September 1833, marked No. 138, transmits a Bill by the Superintendent of Canals for expense incurred in making Tow-paths to the Soondurbun Canals, amounting to Sa. Rs. 813 : 7 : 8.
- Ditto, 16th June
1835, No. 28. No. 281. Petition by Dhooman Khan, dated 26th May 1835, begging that he may be allowed to rent the Government Lands along the Banks of the Mofussil Canals between Baminghatta and Chilatullah.
- Ditto ditto, No. No. 282. Letter from Secretary to Military Board, dated 6th June 1835, to Superintending Engineer, L. P., transmitting the Paper marked No. 281, and requesting him to direct the Superintendent of Canals to enter into such arrangement with the Petitioner, Dhooman Khan, as may appear to him most fit. ..
- Ditto ditto, No. 30. No. 283. Letter from Superintendent of Canals, dated 10th June 1835, to Superintending Engineer, L. P., stating, that there are no Government Lands on the Banks of the Soondurbun Canals that could be rented ; that Dhooman Khan must be aware that he has no Grounds for his Petition ; and that he, the Superintendent, suspects that Dhooman Khan has taken possession of Grounds belonging to Zemindars, stating, that it pertains to Government, and that he occupies it by permission.
- Ditto ditto, No. 31. No. 284. Letter from Secretary to Military Board, dated 16th June 1835, to Superintending Engineer, L. P., transmitting an extract of a Letter No. 157, of the 27th February last, marked No. 253,

from Captain Thomson, and requesting him to call on that Officer to state any objections that he considers to exist to renting the Lands on the banks of the Canals adverted to. . .

- No. 285. Letter from Superintendent of Canals, dated the 23rd June 1835, to Superintending Engineer, L. P., stating, that the Ground on the banks of the Soondurbun Canals stated to be available for rent, has subsequently been washed away. . .
- Military Board's
Proceedings, 30th
June 1835, No. 31.
- No. 286. Letter from Secretary to Sudder Board of Revenue, dated 13th July 1835, to Secretary to Military Board, in reply to Board's Letter of 1st May last, requests to know what would be the expense of removing the impediment in Tolly's Nullah by hand labour and by the Dredging Machine, and if by the former, it be cheaper, whether it is advisable to recommend the sale of the Dredging Vessel.
- Ditto, 21st July
1835, No. 18.
- No. 287. Letter from Secretary to Military Board, dated 21st July 1835, to Secretary to Sudder Board of Revenue, replying to his Letter of the 13th instant, marked No. 286, and transmitting Captain Thomson's Letter of the 18th April, 1835, and Colonel Tickell's Letter of the 28th April, 1835, marked No. 274. and No.
- Ditto ditto, No. 19.
- No. 288. Letter from Superintendent of Canals, dated 1st August 1835, to the Superintending Engineer, L. P., reporting the result of the experiment of admitting a current into the Circular Canal, and working the Dredging Vessel for three weeks in the Balliaghatta Canal, and stating, that the current which was admitted into the Canal in May and June, has almost entirely swept out the sediment from the Circular and Balliaghatta Canals with no injury to the Banks, except in those parts improperly obstructed with Boats.
- Ditto, 8th September
1835, No. 50.
- No. 289. Letter from Superintendent of Canals, dated 6th August 1835, to Superintending Engineer, L. P., stating, that the earth taken up by the Dredger from the Balliaghatta Canal has been thrown on its Banks, so as to continue the Banks to meet those of the Lake Channel; as when that work is done, he will continue the Embankments along the Lake Channel. . .
- Ditto ditto, No. 53.
- No. 290. Letter from Superintendent of Canals, dated 11th August 1835, to Superintending Engineer, L. P., stating, that as the probable expense of repairs for the maintenance of the Canals will greatly depend on the management of the Lock Gates remaining under his control; the regulating of Boats in the Canal; and the prevention of injury to the Banks; he will, when those points are settled, and he has had experience of their effects, be able to supply the information desired in the
- Ditto ditto, No. 52.

Board's Letter of the 10th instant, in respect to the expense of Dredging and keeping in repair the Canals.

Military Board's
Proceedings, 18th
September 1835,
No. 42.

No. 291. Letter from Secretary to Government, dated 12th May 1835, to Military Board, transmitting the Paper marked No. 291. *a.* and No. 291. *b.*

Ditto ditto, No.

No. 291. *a.* Extract of a Dispatch from the Honorable the Court of Directors, No. 4, dated the 14th May 1834, in the Revenue Department, Paragraphs 6 to 11, stating, that they trust that the New Canal through the Soonderbuns will answer the expectations that have been formed respecting it, and thus render the Navigation of the Jellinghee and Bhagaruttee, a matter of less importance than it has hitherto been.

Ditto ditto, No.

No. 291. *b.* Extract of a Resolution of the Honorable the Governor General of India in Council, in the Revenue Department, passed on the 6th April 1835, directing, with respect to the New Canal through the Soonderbuns, that the Military Board's attention be now called to that subject, in order to ascertain how far the Canal has answered the purposes for which it was executed. ..

Ditto ditto, No.

No. 292. Letter from Secretary to Military Board, dated 31st July 1835, to the Collector of Calcutta, requesting him to state, what is the net amount of Tolls annually collected from Tolley's Nullah during the last five years, and whether an increase of Toll might be expected by improving the Nullah.

Ditto ditto, No. 44.

No. 293. Letter from the Collector of Calcutta, dated 6th August 1835, to the Officiating Secretary to Military Board, transmitting the Paper marked No. 293. *a.*, and stating, that there is no doubt that an increase of Toll would accrue by deepening the Channel of Tolley's Nullah.

Ditto ditto, No.

No. 293. *a.* Statement of the amount of Collections of Tolley's Nullah for the last five years; viz. from 1830-31 to 1834-35.

Ditto ditto, No. 45.

No. 294. Letter from Military Board, dated 18th September 1835, to the Governor of Bengal, reporting, with reference to the Papers marked No. 291. *a.* and No. 291. *b.* on the Soonderbun Canals, and referring his Honor to the statement which accompanied their Letter, No. 4,737, of the 20th January last, to the address of the Governor General in Council, which they believe will be found to contain the information now desired respecting the expenditure on embankments from the date of their being placed under the control of the Military Board. ..

Ditto, 23rd October 1835, No. 38.

No. 295. Letter from Superintendent of Canals, dated 17th October 1835, to Superintending Engineer, L. P., reporting, that the

quantity of mud deposited in the Circular Canal at the close of the rains, and previous to opening the Lock Gates, amounts to cubic feet 3,14,000.

- No. 296. Letter from Secretary to Government, dated 31st March 1835, to Military Board, with reference to Board's Letter, No. 2,525, of the 12th September last, (marked No. 219.) requests that they will report the results of their lengthened experience with respect to the degree of benefit derived from the Circular Canal, and the expediency or otherwise of keeping it open with establishments, &c. upon the present footing.
- No. 297. Letter from Collector of Calcutta, dated 22nd April 1835, to Secretary to Military Board, transmitting the Paper marked No. 297. a.
- No. 297. a. Statement exhibiting the Receipts of the amount of Tolls at the Chowkies on the Circular and Entally Canals, from August 1834 to March 1835, inclusive.
- No. 298. Letter from Superintending Engineer, L. P., dated 24th April 1835, to Secretary to Military Board, transmitting the Paper marked 298. a.
- No. 298. a. Table shewing the number of Boats that have passed through the Chitpore Locks, from the 29th August 1834 to 31st of March 1835, inclusive.
- No. 299. Table shewing the number of Boats that have passed through the Chitpore Locks, from 1st of April to 30th June 1835, by the Superintendent of Canals.
- No. 300. Table shewing the number of Boats that passed through the Circular Canal, from July 1833 to April 1835.
- No. 301. Letter from Secretary to Military Board, dated 8th July 1835, to Collector of Calcutta, requesting him to furnish a supplemental statement of the Tolls collected during the months of April last in the Circular and Entallee Canals, and to state whether the amount of Tolls specified in the Statement of the 11th August 1834, and that above quoted contains the gross or net amount of Tolls realized.
- No. 302. Letter from Collector of Calcutta, dated 13th July 1835, to the Secretary to the Military Board, transmitting the Paper marked No. 302. a.
- No. 302. a. Supplementary Statement, exhibiting the Receipts of the Amount of Tolls at the Chowkee on the Circular and Entallee Canals, from 1st to 30th of April 1835.

Military Board's
Proceedings, 27th
October 1835, No.
37.

Ditto ditto, No. 38.

Ditto ditto, No.

Ditto ditto, No. 39.

Ditto ditto, No.

Ditto ditto, No. 40.

Ditto ditto, No. 41.

Ditto ditto, No.

Ditto ditto, No. 42.

Ditto ditto, No.

Military Board's Proceedings, 27th October 1835, No. 43.	No. 303. Statement, exhibiting the Receipts of the Amount of Tolls at the Chowkee on the Circular and Entallee Canal, from 31st November 1834, to April 1835.
Ditto ditto, No. 44.	No. 304. Statement of Rents collected by the Aumeen, from the tenants occupying the Surplus Lands along the Circular Canal. ..
Ditto ditto, No. 45.	No. 305. Statement, exhibiting the receipt of Rent of the Surplus Land leased on the sides of the Circular Canal, from January 1834 to 30th April 1835, furnished by the Record-keeper in charge for collection, dated 28th July 1835.
Ditto ditto, No.	No. 306. Letter from Secretary to Military Board, dated 21st July 1835, to Civil Auditor, requesting him to furnish a Statement of the Staff Salary Bills of the Superintendent of the Circular and Eastern Canals.
Ditto ditto, No.	No. 307. Letter from Secretary to Military Board, dated 24th July 1835, to the Civil Auditor, requesting him to furnish a Statement of the Staff Salary Bills of the Agent, for Iron Suspension Bridges.
Ditto ditto, No.	No. 308. Letter from Civil Auditor, dated 28th July 1835, to Secretary to Military Board, furnishing the information called for, in the Paper marked No. 306.
Ditto ditto, No.	No. 309. Letter from Civil Auditor, dated 31st July 1835, to Military Board, furnishing the information called for in the Paper marked No. 307.
Ditto ditto, No. 48.	No. 310. Summary of the Expense of constructing the Circular Canal, from its commencement in 1823-24 to 1st May 1835, amounting to Rs. 14,43,473 : 11 : 1½.
Ditto ditto, No. • Which it is believed cost only Rs. 10,771—See Revenue Consultation 5th May, 1829, Nos. 1. and 2.—J. M.	No. 311. Summary of the Expense of constructing the Soondurbun Canal, from its commencement in 1823-24 to 1st May 1835, amounting to Rs. 3,33,650 : 15 : 8½, exclusive of Ground.* ..
Ditto ditto, No.	No. 312. Summary of the Expense of maintaining the Entallee and Ballia-ghata Canals, from 1823-24 to 1834-35, amounting to Rs. 52,142 : 2 : 5¼.
Ditto ditto, No.	No. 313. Statement, shewing the proportion of the Establishment Charges borne by the different branches of the Canals, and that of the Superintendent of Canals.
Ditto ditto, No.	No. 314. Statement of the Canal Committee's Office Establishment, from 1822-23 to 1830-31.
Ditto ditto, No.	No. 315. Letter from Secretary to Military Board, dated 25th October 1835, to Collector of Calcutta, requesting to be furnished with

a Statement of the monthly charge incurred for collecting the Tolls on the Circular Canal.	
No. 316. Letter from Collector of Calcutta, dated 2d November 1835, to Secretary to Military Board, transmitting the Paper marked No. 316. a.	Military Board's Proceedings, 27th October 1835, No. 49.
No. 316. a. Statement, exhibiting the Receipts of the amount of Tolls at the Chowkey in the new Circular Canal, from the date of the opening of the Canal till the 30th of April 1835.	Ditto ditto, No. 50.
No. 317. Ditto—Abstract of works necessary for putting in repair the Canals and works connected with them.	Ditto ditto, No.
No. 318. Extract of a Letter from the Superintendent of Canals No. 162, of 1st April 1835, to the address of the Superintending Engineer, L. P.	Ditto ditto, No.
No. 319. Letter from the Military Board, dated 27th October 1835, to the Honorable the Governor of Bengal, with reference to the Paper marked No. 296, reports upon the degree of benefit derived from the Circular Canal, and the expediency of keeping it open, with establishments, &c. upon its present footing, and transmits the Papers marked No. 288. No. 295. No. 300. to No. 304. No. 310. No. 313. No. 314. No. 317. and No. 318.	Ditto ditto, No. 51.
No. 320. Remarks by the Superintendent of Canals on the Military Board's Report on the Circular Canal marked No. 319. ..	Ditto ditto, No.
No. 321. Minute by the Chief Magistrate, with reference to the Board's Report of the 27th October last, urging that the affairs connected with the Tolls be brought to such an issue, that Government may derive something like an adequate return for the outlay expended on the Canal.	
No. 322. Letter from Dwarkanath Tagore, Esq., dated 20th January 1836, to D. M'Farlan, Esq. on the subject of the payment of Tolls on the Circular and Balliaghatta Canals.	Ditto ditto, No.
No. 323. Letter from Secretary to Government, dated 16th September 1835, to Military Board, transmitting the Papers marked No. 323. a., No. 323. b. and No. 323. c.	Ditto, 30th October 1835, No. 38.
No. 323. a. Letter from G. A. Prinsep, Esq., dated 5th September 1835, to the Secretary to Government, submitting the remarks and observations made by him on the 19th ultimo, relative to the rules laid down for the future guidance of the Superintendent of Canals, in respect to the opening and shutting of the Lock	Ditto ditto, No.

Gates, and for reasons assigned, suspends taking measures to dismantle the works at Balliaghaut.

- Military Board's
Proceedings, 30th
Oct. 1835, No. No. 323. *b.* Letter from G. A. Prinsep, Esq., dated 15th September 1835, to Secretary to Government, with reference to his, Mr. Prinsep's, Letter of the 5th instant, submits a proposition for renting the Tolls of the Canals, and states conditions.
- Ditto ditto, No. No. 323. *c.* Letter from Secretary to Government, dated 16th September 1835, to G. A. Prinsep, Esq., in reply to his Letters of the 5th and 15th instant, states, that his representation relative to the Chitpore Lock Gates will be forwarded to the Military Board for their consideration, and refers him to the Collector, with respect to his offer to farm the Tolls of the Canal.
- Ditto ditto, No. 7. No. 324. Letter from Secretary to Government, dated 17th November 1835, to Military Board, in reply to their Letter of the 27th October relative to the Circular Canal, states, that Government are disposed to sanction generally the proposed experiment of consolidating the Tolls levied in the Balliaghatta Canal with that now exacted at the junction of the Circular with the Balliaghatta Canal, and requests to know the amount of Toll proposed to be levied at each extremity of the general line, and sanctions the outlay proposed.
- Ditto ditto, No. 2. No. 325. Letter from Secretary to Government, dated 11th November 1835, to Military Board, in reply to their Letter, No. 3,615, of the 30th ultimo, requests to know what steps they have taken in regard to the Bund or Tow-path in the Salt Water Lakes, and if commenced, by what time it is likely to be completed.
- Ditto, 15th December 1835, No. 55. No. 326. Letter from Superintending Engineer, L. P., dated 15th October 1835, to Secretary to Military Board, transmitting the Bill of the Superintendent of Canals, for constructing the Cess Pool in the Entallee Canal, and partly cleaning it out, amounting to Rs. 732:9:0, and stating, that the Bill is accompanied by a competent Survey Report.
- Ditto ditto, No. No. 327. Letter from Secretary to Military Board, dated 15th December 1835, to the Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 326, and recommending that it be passed.
- Ditto ditto, No. No. 328. Letter from Military Board, dated 15th December 1835, to the Governor of Bengal, reporting on the Entallee and Balliaghatta Canals, and requesting sanction to the disbursement of Rs. 8,280, for the execution of repairs necessary to preserve the Communication of those Canals in an efficient state, and

stating, that they will shortly submit decisive measures for the future regulation of Tolls on those Canals.

- No. 329. Letter from Superintendent of Canals, dated 20th November 1835, to Superintending Engineer, L. P., reporting the progress that has been made in constructing the Tow-paths in the Salt Water Lakes, and stating, that the Proprietors of the Fisheries of the Lake have started an objection to the shutting up of the Nullahs of the Lake Channel.

Military Board's Proceedings, 22nd December 1835, No. 59.

- No. 330. Letter from Secretary to Government, dated 22nd December 1835, to the Military Board, in reply to their Letter of the 15th instant, sanctions the Disbursement of the sum not exceeding Rs. 8,280, for placing the communication upon the Balliaghatta and Entallee Canals in an efficient state, as recommended by the Board ; viz.

Ditto, 29th December 1835, No. 11.

Cleaning out the Dhurruhtollah Cess Pool, Rs. 550 0
Excavating the Canal West of the Koolyah Bridge, 3,380 0
Repairing and Draining the Banks of the Entallee Canal, 850 0 0
Repairing the Pucka Road along the Banks of ditto, 500 0 0
Cutting down, levelling, and repairing the Slopes and Drains of the Balliaghatta Canal, . . 3,000 0 0

Rs. 8,280 0 0

- No. 331. Letter from Secretary to Military Board, dated 29th September 1835, to the Agent for Iron Suspension Bridges, requesting him to furnish a Statement of the number and description of Bridges made up in the Iron Suspension Bridge Yard, since its first establishment to the 1st of May 1835, and cost of their construction, including all charges, except that of the monthly establishment.

Ditto, 15th January 1836, No. 40.

- No. 332. Letter from the Agent for Iron Suspension Bridges, dated 9th October 1835, to the Superintending Engineer, L. P., transmitting, with observations, the Paper marked No. 332. a. . .

Ditto ditto, No. 41.

- No. 332. a. Statement shewing the number of Bridges made at the Allypore Iron Bridge Yard, and the expense incurred thereon, from the first establishment of the Yard in 1823 to the 1st of May 1835.

Ditto ditto, No. 42.

- No. 333. Letter from the Military Board, dated 15th January 1836, to the Governor of Bengal, transmitting, with observations, the Papers marked No. 332. and No. 332. a.

Ditto ditto, No. 43.

- No. 334. Letter from the Chief Magistrate, dated 24th February 1836, to the Secretary to Military Board, relative to the present state of

Ditto, 1st March 1836, No. 18.

the Dhurumtollah Main Drain, which he states has been shut up for more than a month by Captain Thomson, on account of the operations going on for clearing the Entally Canal. . .

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| Military Board's
Proceedings, 1st
March 1836, No.
20. | No. 335. Letter from the Secretary to Military Board, dated 1st March 1836, No. 6,086, to the Superintendent of Canals, transmitting the Paper marked No. 334. |
| Ditto, 4th March
1836, No. 42. | No. 336. Letter from Superintendent of Canals, dated 4th March 1836, to the Secretary to Military Board, in reply to his Letter No. 6086, communicates on the subject of letting off the water accumulated in the Dhurumtollah Drain. |
| Ditto, 15th March
1836, No. 3. | No. 337. Letter from Secretary to Government, dated 9th March 1836, to Military Board, in reply to their Letter No. 6,103 of 4th instant, authorizes an advance of Rs. 3,275, in favor of Superintendent of Canals, on account of making two Tow-paths in the Salt Water Lake. |
| Ditto, 29th March
1836, No. 68. | No. 338. Letter from Superintendent of Canals, dated 11th March 1836, to Superintending Engineer, L. P., on the subject of his Bills for making Tow-paths to the Sunderbund Canals. |
| Ditto, 8th April
1836, No. 19. | No. 339. Letter from Superintendent of Canals, dated 3rd February 1836, to Superintending Engineer, L. P., transmitting a revised Estimate of the probable expense of cleaning out the Entally Canal, from the Dhurumtollah Drain to the Coolya Bridge, and Draining and Repairing the Road on its Banks, amounting to Co's. Rs. 10,414, and a revised Estimate of probable expense of making embankments on the sides of the Lake Channel, amounting to Co's. Rs. 4,825. |
| Ditto, 12th April
1836, No. 58. | No. 340. Letter from Superintendent of Canals, dated 13th February 1836, to the Secretary to Military Board, reporting, that the rain has broken down both the Dams on the Dhurumtollah Drain, and swept away the Rivetment which forms the Cess Pool at the mouth of the Drain, and remarking, that under the present system, the digging out of the Entallee Canal, as it becomes filled with mud, cannot be continued any longer. |
| Ditto ditto, No. 60. | No. 341. Letter from Military Board, dated 4th March 1836, No. 6,143, to the Governor of Bengal, transmitting the Paper marked No. 340, with observations, and stating that the probable cost of rebuilding the wall of the Dhurumtollah Cess Pool will be Rs. 550. |
| Ditto ditto, No. 65. | No. 342. Letter from Superintendent of Canals, dated 11th March 1836, to Superintending Engineer, L. P., transmitting, with observations, the Paper marked No. 342. a. |

PAGE.

- No. 342. *a.* Estimate of the probable expense of rebuilding in the Entally Canal the Cess Pool of the Dhurrumtollah Drain, amounting to Co's Rs. 554 : 14 : 1.
 Military Board
 Proceedings 12th
 April 1836, No. 65.
- No. 343. Letter from Secretary to the Government of Bengal, dated 22nd March 1836, to Military Board, in reply to their Letter No. 6,143, of the 4th Instant, authorizes the Superintendent of Canals to re-construct the wall of the Dhurrumtollah Cess Pool, which was carried away by the heavy showers of rain in February last, at an expense not exceeding Co's. Rs. 550, as recommended by the Board.
 Ditto ditto, No. 61.
- No. 344. Letter from Superintendent of Canals, dated 10th August 1836, to the Superintending Engineer, L. P., relative to the necessity of enacting some regulations for the preservation and better management of the Canals under his charge.
 Ditto, 29th April
 1836, No. 38.
- No. 345. Letter from Secretary to Military Board, dated 28th August 1835, to Secretary to Sudder Board of Revenue, requesting to be favored with certain Papers relative to the better regulation of Tolls, Boats, &c. in the Entally and other Canals. ..
 Ditto ditto, No. 39.
- No. 346. Letter from Secretary to Sudder Board of Revenue, dated 4th September 1835, to Secretary to Military Board, transmitting the Papers marked No. 346, *a.* to No. 346, *c.* inclusive. ..
 Ditto ditto, No. 40.
- No. 346. *a.* Minute, dated 29th January 1834, by W. W. Bird, Esq., submitting with observations, the Paper marked No. 346. *a.*⁽¹⁾
 Ditto ditto, No. 41.
- No. 346. *a.*⁽¹⁾ Draft of a proposed Regulation for regulating the Tolls, and securing the unimpeded Navigation of the Balliaghatta and Circular Canals.
 Ditto ditto, ditto.
- No. 346. *b.* Minute by James Pattie, Esq., dated 27th February 1834, submitting with observations, the Paper marked No. 346. *b.*⁽¹⁾
 Ditto ditto, ditto.
- No. 346. *b.*⁽¹⁾ Draft of a proposed Regulation for levying the Tolls and for improving the Navigation of the Balliaghatta and Circular Canal and Eastern Canal, commonly called Tolly's Nullah, and all the artificial and natural Canal and Channels connecting the Balliaghatta and Eastern Canals with the Issamuttee River.
 Ditto ditto, ditto.
- No. 346. *c.* Letter from Acting Secretary to Sudder Board of Revenue, dated 1st April 1834, to the Secretary to the Government, Revenue Department, transmitting, with observations, the Papers marked No. 346. *a.* to No. 346. *b.*⁽¹⁾ inclusive. ..
 Ditto ditto, ditto.
- No. 347. Minute by D. McFarlan, Esq., dated 8th July 1835, relative to the Establishment kept up on account of letting out and re-

ceiving the Rents, &c. of the Surplus Ground of the Circular Canal.

- Military Board's Proceedings, 29th April 1836, No. 43.** No. 348. Letter from Secretary to Military Board, dated 17th July 1835, transmitting Copy of the Paper marked No. 347, and stating that the Board are anxious to make over to the Chief Magistrate's charge the whole of the Surplus Lands of the Circular Canal, together with the Documents relative thereto. . .
- Ditto ditto, No. 44.** No. 349. Letter from Secretary to Military Board, No. 6790, dated 5th April 1836, to Superintendent of Canals, requesting his opinion upon certain points connected with the Papers marked No. 346. a. to No. 346. c. inclusive.
- Ditto ditto, No. 45.** No. 350. Letter from Superintendent of Canals, dated 11th April 1836, to Secretary to Military Board, replying to his Letter, No. 6790, marked No. 349.
- Ditto ditto, No. 46.** No. 351. Letter from Military Board, dated 29th April 1836, to the Governor of Bengal, with reference to Mr. Secretary Mangles' Letter No. 1,272, of the 17th November last, relative to the amount of Toll it would be expedient to levy at each end of the Circular and Balliaghatta Canal, submit their observations, and transmit the Papers marked No. 349. to No. 350. . .
- Ditto, 1st July 1836, No.** No. 352. Letter from Superintending Engineer, L. P., dated 21st May 1836, to Secretary to Military Board, transmitting a Bill amounting to Rupees 540 : 7 : 9, by the Superintendent of Canals, for rebuilding in the Entally Canal the Cess Pool to the Dhurrumtollah Drain.
- Ditto, 29th July 1836, No. 37.** No. 353. Letter from Secretary to Government of Bengal, dated 9th July 1836, to Military Board, requesting them, in communication with James Prinsep, Esq. to direct their attention to a Draft of a proposed Canal Act, published in the Calcutta Gazette, of the 6th instant, and requesting their sentiments thereon. . .
- Ditto ditto, No. 38.** No. 354. Letter from James Prinsep, Esq., dated 20th July 1836, to Assistant Secretary to Military Board, transmitting the Paper marked No. 354. a.
- Ditto ditto, No. 39.** No. 354. a. Memorandum on the Draft of an Act for regulating the Tolls on the Circular Canal and Tolly's Nulla, dated 10th July 1836, by James Prinsep, Esq.
- Ditto ditto, No. 40.** No. 355. Letter from Military Board, dated 29th July 1836, to the Governor of Bengal, replying to Mr. Secretary Mangles' Communication of the 9th instant, No. 986, and transmitting the Paper marked No. 354. a.

- No. 356. Letter from Superintending Engineer, L. P., dated 24th June 1836, to the Secretary to the Military Board, transmitting with observations, the Papers marked No. 356. *a.* to No. 356. *d.* ... Military Board's Proceedings, 12th August 1836, No. 49.
- No. 356. *a.* Letter from Superintendent of Canals, dated 6th June 1836, to Superintending Engineer, L. P., with reference to his Letter of the 14th ultimo, resumes the subject of the consideration of the best manner of removing and preventing the Mud brought into the Canals by the Town Drains. Ditto ditto, ditto.
- No. 356. *b.* Letter from Superintendent of Canals, dated 17th June 1836, to Superintending Engineer, L. P., in answer to his Letter No. 640, states a few cases in which a Dredging Boat would be a great convenience, and so far economical as to cover the expense of it. Ditto ditto, ditto.
- No. 356. *c.* Memorandum of the Steam Dredging Vessel, dated 27th May 1836. Ditto ditto, ditto.
- No. 356. *d.* Letter from Superintendent of Canals, dated 17th June 1836, to Superintending Engineer, L. P., in reply to his Letter of the 15th instant, submits to his consideration the Plan he proposed adopting for bringing forward the scheme of altering the Drains running into the Circular Canals. Ditto ditto, ditto.
- No. 357. Letter from Secretary to Military Board, dated 12th August 1836, to Superintending Engineer, L. P., with reference to his Letter of the 24th June, requests him to call on the Superintendent of Canals to furnish a more accurate and detailed specification of the works he proposes. Ditto ditto, No.
- No. 358. Letter from Superintending Engineers, L. P., 25th June 1836, to Secretary to Military Board, submitting a detail of the present state of the several Canal works in progress, and transmitting the Papers marked No. 358. *a.*, No. 358. *b.* and No. 358. *c.* Ditto, 16th August 1836, No. 48.
- No. 358. *a.* Letter from Superintendent of Canals, dated 11th May 1836, to Superintending Engineer, submitting a detail of the state and progress of the works which were authorized to be done to the Canals, &c. Ditto ditto, ditto
- No. 358. *b.* Letter from Superintending Engineer, L. P., dated 19th May 1836, to Superintendent of Canals, requesting him to furnish a detailed Report of his intended operations on the Canals for the ensuing season. Ditto ditto, ditto.
- No. 358. *c.* Letter from Superintendent of Canals, dated 24th May 1836, to Superintending Engineer, L. P., stating, that previous to giving a detailed reply to his Letter of the 19th instant, he

begs to observe, that to improve the management of the Canals and to Estimate with any certainty the probable expense before hand, it is necessary to accumulate a large number of facts, and refers to the 2nd Para. of His Letter of the 19th January 1836.

Military Board's
Proceedings, 16th
August 1836, No.

No. 359. Letter from Secretary to Military Board, dated ——— No. 2556, to the Superintending Engineer, L. P., in reply to his Letter No. 1204, of the 28th July last, transmitting a report by the Superintendent of Canals, on the state of the Sunderbund Canale, states, that the Board will await the receipt of Estimates on the several works proposed to be executed by that Officer, and that the Board will be glad to receive fuller explanations on the cause of the current running up the Lake Channel for an hour after high water.

Ditto ditto, No.

No. 360. Letter from Military Board, dated 16th August 1842, to the Right Honorable the Governor of Bengal, transmitting the Papers marked No. 358, No. 358, a. to No. 358, c. inclusive.

Ditto, 9th September
1836, No. 23.

No. 361 Letter from Superintendent of Canals, dated 26th August 1836, to Superintending Engineer, L. P., stating, that it is not in his power to transmit Estimates of the expense of keeping the Circular Canal free from Silt, that since the opening of the Canal Locks he considers the proposition for altering the Town Drains to prevent their bringing Mud into the Canal most important to the prosperity of the Circular Canal.

Ditto, 14th October
1836, No.

No. 362. Letter from Military Board, dated 14th October 1836, to the Governor of Bengal, in continuation of their letter of the 16th August last, recommend, in consequence of an error in the Estimate No. 67, authorised on the 30th August last, that the additional Sum of Rs. 1,350, be sanctioned for the repairs of the Canal.

Ditto, 2nd December
1836, No. 31.

No. 363. Letter from Secretary to Government of Bengal, dated 1st November 1836, to Military Board, transmitting the Papers marked No. 363. a., to No. 363. g. inclusive, and referring them to the Extra Government Gazette of the 1st instant, where Act No. XXII, of 1836, is printed; and requests the Board will assume the general Fiscal as well as Conservative Superintendence of the several lines of the Circular and Eastern Canals, specified in Act No. XXII, of 1836, and requesting a Report, whether Rules of the nature of those Drafted relative to Tolls, might not advantageously be generally introduced for the Trade of the City and Port.

Ditto ditto, No. 32.

No. 363. a. Letter from Secretary to Government of Bengal, dated 27th September 1836, addressed respectively to D. McFarlan, Esq.,

Lieut. Col. J. Craigie, Major Irvine, and Captain Thomson, appointing them a Committee to consider and report in which way the provisions of the Act passed by the Supreme Government on the 26th instant, may most beneficially be carried into effect.

No. 363. *b.* Letter from the Committee referred to in the Paper marked No. 363, *a.* dated 26th October 1836, to the Governor of Bengal, reporting on the subjects referred to them, and transmitting the Papers marked No. 363. *b.*(1) to No. 363. *b.*(6) inclusive. ..

Military Board's
Proceedings,
December 18

No. 363. *b.*(1) Table of Tolls proposed to be posted up at each Toll House.

Ditto ditto, ditto.

No. 363. *b.*(2) Proposed Rules for the guidance of the Officer in charge of the Collections of the Tolls.

Ditto ditto, ditto.

No. 363. *b.*(3) Proposed Rules for the guidance of the Toll-keeper. ..

Ditto ditto, ditto.

No. 363. *b.*(4) Estimate for building Toll Houses.

Ditto ditto, ditto.

No. 363. *b.*(5) Proposed Rules for the supervision and preservation of the Navigation of the Canal.

Ditto ditto, ditto.

No. 363. *b.*(6) Statement of the Establishment necessary for the supervision and preservation of the Canal.

Ditto ditto, ditto.

No. 363. *c.* Letter from Secretary to Government of Bengal, dated 29th October 1836, to the Canal Committee, acknowledging the receipt of their able Report of the 26th instant, and stating, that His Lordship entirely approves the rates of Tolls and Rent which they have proposed, and transmitting certain instructions for their guidance.

Ditto ditto, ditto.

No. 363. *d.* Letter from Secretary to Government of Bengal, dated 29th October 1836, to the Commissioner of Jessore, informing him, that it is the intention of the Governor of Bengal to appoint on the 1st proximo, Captain John Thomson, Engineers, to be Collector of the Tolls and Rent throughout the lines of Canal, specified in Section II. No. 22, of 1836, and requesting him to instruct the Officiating Collector of the 24 Pergunnahs, to make over charge of the above to Captain Thomson, on the above date.

Ditto ditto, ditto.

No. 363. *e.* Letter from the Canal Committee, dated 31st October 1836, to the Governor of Bengal, in reply to the Letter of the Secretary to the Government of Bengal, dated 29th instant, transmits the Paper marked No. 363, *e.*(1)

Ditto ditto, ditto.

No. 363. *e.*(1) Notification of the Appointment of the Collector of Tolls

Ditto ditto, ditto.

and Rent on the Canals, with a copy of Appendix 'A, to the Committee's Report modified as directed, and situations of the Toll Houses added.

Military Board's
Proceedings, 2nd
December 1836,

No. 363. *f.* Letter from Secretary to Government of Bengal, dated 1st November 1836, to the Canal Committee, communicating the observations and orders of Government upon their Report of the 26th ultimo, in continuation of his Letter of the 29th idem.

Ditto ditto, No.

No. 363. *g.* Letter from Secretary to Government of Bengal, dated 1st November 1836, to Captain Thomson, stating, that the Governor of Bengal having been pleased to entrust to the Military Board the general Fiscal as well as Conservative superintendence of the several lines of Canals specified in Act No. XXII, of the current year, he is requested to place himself under their orders.

Ditto ditto, No.

No. 364. Letter from Secretary to Military Board, dated 2nd December 1836, to Captain Thomson, transmitting for his consideration, Draft of certain Rules regarding the Collection of Tolls, which it is under contemplation to enforce on the Canals under his charge, and requesting him to report upon the above Rules. ..

Ditto, 20th January
1837, No. 57.

No. 365. Letter from Superintending Engineer, L. P., dated 13th October 1836, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in cleaning out the Dhurrumtollah Cess Pool, and excavating the Canal West of Cooleah Bridge, and repairing and Draining the Bank of the Entally Canal, and repairing the Pucka Road along its Banks, amounting to Co's. Rs. 5,480 : 1 : 3, also a Bill for Levelling and Draining the Eastern and Western Banks of the Circular Canal, amounting to Rupees 3,094 : 15 : 10. ..

Ditto ditto, ditto.

No. 366. Letter from Secretary to Military Board, dated 2nd December 1836, to Superintending Engineer, L. P., returning the two Bills transmitted in the Superintendent's Letter of the 13th ultimo, and requesting him to furnish the Board with the result of his observations on the manner in which the Works charged in the above Bills, have been executed, and to report generally on the Works in progress under the Superintendent of Canals.

Ditto ditto, No. 58.

No. 367. Letter from Superintending Engineer, L. P., dated 24th December 1836, to Secretary to Military Board, in reply to Board's Letter No. 4,239, of the 2nd instant, returns Bills by Captain Thomson, for certain repairs, &c. to the Circular and Entally Canals with his opinion, and reports on the progress made in the Works sanctioned for the improvement of the Canals. ..

No. 368. Letter from Secretary to Military Board, dated 20th January 1837, to Superintending Engineer, L. P., stating that the Bills transmitted in his Letter of 2nd December 1836, have this day been passed by the Board, and transmitted for adjustment to the Office of the Accountant General. . . .

No. 369. Letter from Superintendent of Canals, dated 5th December 1836, to Secretary to Military Board, stating, that up to the 1st November 1836, a Toll of 4 Annas was collected from every loaded Boat or Saultee that navigated the Kamapookerya Khal, and the annual produce of this Toll has been estimated at 10,000 to 8,000 Sicca Rupees; that if the Board are of opinion that the Kamapookerya Khal forms, or may be considered as a part of Tolley's Nullah, which it is very necessary it should be, that he will in that event levy Toll on the same from the 1st instant. . . .

Ditto 27th January
1837, No. 32.

No. 370. Letter from Secretary to Military Board, dated 20th December 1836, to Superintendent of Canals, in reply to his Letter of the 5th instant, requests him to state in what manner the Boats belonging to the Kamapookerya Khal can be distinguished from those which navigate Tolley's Nullah, and how he proposes to levy Rent on the former, and whether there is any objection to levying Toll on Boats passing out of the Khal. . .

Ditto ditto, No. 33.

No. 371. Letter from Superintendent of Canals, dated 23rd December 1836, to Secretary to Military Board, in reply to his Letter of the 20th instant, states, that the Boats belonging to the Kamapookerya Nullah cannot be distinguished from other Boats, but he proposes to apply the same rule to them as to any other Boats found in the Canal without a Ticket; that the expense of collecting the Toll at the mouth of the Kamapookerya Nullah would be greater than the amount of Toll that could be realised. . .

Ditto ditto, No. 34.

No. 372. Letter from Secretary to Military Board, dated 6th January 1837, to Superintendent of Canals, with reference to his Letter of the 23rd ultimo, requests him to state how far the Toll he proposes to levy will affect the Proprietors of Boats in the Kamapookerya Khal, and whether the Toll now proposed to be levied will give a higher amount than that formerly received.

Ditto ditto, No. 35.

No. 373. Letter from Superintendent of Canals, dated 14th January 1837, to Secretary to Military Board, in reply to his Letter of the 8th [6th] instant, states, that 9-10th of the traffic in the Kamapookerya Khal is carried on in Saultees, or Boats under 25 maunds burthen, and that the few Boats in excess of this burthen will be driven out of the Trade; that formerly about Rupees 10,000 a year must have been realized by Toll from the above Khal, and that there will now be nothing. . . .

Ditto ditto, No. 36.

- Military Board's Proceedings, 27th Jan. 1837, No. 37.** No. 374. Letter from Superintendent of Canals, dated 5th January 1837, to Secretary to Military Board, stating, that the Ferries on Tolley's Nullah and Balliaghatta Canal have been transferred to his charge by the Collector of Calcutta; that he had farmed the Ferries, the former for 3 years at Rs. 101, per annum, and the latter had been farmed by the Sudder Board on the 13th January 1833, for Sicca Rupees 441 a-year, for 6 years. ..
- Ditto ditto, No.** No. 375. Letter from Secretary to Military Board, dated 27th January 1837, to Superintendent of Canals, stating, that it appears very objectionable that the rate of any Ferry should not be specifically known, and requesting him to state what he thinks should be the rate of Toll levied at the Ferries in question. ..
- Ditto 17th February 1837, No. 67.** No. 376. Letter from Superintendent of Canals, dated 2nd January 1837, to Secretary to Military Board, proposing a modification and increase to his Office establishment with reference to the great increase of business arising from the Collection of Tolls. .
- Ditto 28th February 1837, No. 37.** No. 377. Letter from Secretary to the Government of Bengal, dated 8th December 1836, transmitting the Papers marked No. 377. a. and No. 377. a.⁽¹⁾, and requesting a Report on the same. ..
- Ditto ditto, ditto.** No. 377. a. Letter from Messrs. Carr, Tagore and Co., dated 7th December 1836, to the Private Secretary to the Governor General, transmitting the Paper marked No. 377. a.⁽¹⁾ ..
- Ditto ditto, ditto.** No. 377. a.⁽¹⁾ Letter from Messrs. Carr, Tagore and Co., dated 7th December 1837, to the Governor General of India in Council, representing the hardship sustained by them from a change in the Toll rates on Tolley's Nullah, which they did not anticipate when they undertook the contract for supplying Coal to Government. ..
- Ditto ditto, No.** No. 378. Letter from Secretary to Military Board, dated 18th December 1836, No. 4444, to the Superintendent of Canals, transmitting the enclosures referred to in the Paper marked No. 377, and requesting a Report on the same. ..
- Ditto ditto, No. 38.** No. 379. Letter from Superintendent of Canals, dated 17th December 1836, to the Secretary to Military Board, in reply to his Letter of the 13th instant, reports on the subject of the Toll paid by Messrs. Carr, Tagore and Co. ..
- Ditto ditto, No. 39.** No. 380. Letter from Superintendent of Canals, dated 29th November 1836, to the Secretary to the Military Board, transmitting the Paper marked No. 380. a. ..
- Ditto ditto, ditto.** No. 380. a. Petition of a number of Merchants residing near Tolley's

Nullah, stating their grievances in respect to the change in the system of collecting the Tolls on the Canal. A free translation of the above Petition is annexed, prepared in the Military Board's Office.

No. 381. Letter from Secretary to Government of Bengal, Revenue Department, dated 20th December 1836, to Military Board, transmitting the Paper marked No. 381. a.

Military Board's
Proceedings, 28th
Feb. 1837, No. 40.

No. 381. a. Letter from the Secretary to the Military Orphan Society, dated 15th December 1836, to Secretary to Government of Bengal, representing, that the new rates of Tolls have proved ruinous to the Orphan Society's Bazar at Kidderpore, and soliciting a reduction of the charge to its former rate.

Ditto ditto, ditto.

No. 382. Letter from Secretary to Military Board, dated 3rd January 1837, to Superintendent of Canals, with reference to his, the Secretary's, Letter of the 18th ultimo, transmits the Paper marked No. 381. a.

Ditto ditto, No. 41.

No. 383. Letter from Secretary to Government of Bengal, dated 27th December 1836, to Military Board, transmitting the Paper marked No. 383. a.

Ditto ditto, No. 42.

No. 383. a. Petition from certain Native Merchants, complaining of the rates of Tolls levied on Boats in Tolley's Nullah, and the obstructed state of the Nullah.

Ditto ditto, ditto.

No. 384. Letter from Superintendent of Canals, dated 5th January 1837, to Secretary to Military Board, in reply to his Letter of the 3rd instant, submits his opinion relative to the representation made by the Secretary to the Military Orphan Society, respecting the injurious effect which the new rates of Toll charged on Boats entering Tolley's Nullah from the Hooghly are producing on the traffic of the Orphan Gunge or Bazar.

Ditto ditto, No. 43.

No. 385. Letter from Secretary to Government of Bengal, dated 10th January 1837, to Military Board, transmitting the Paper marked No. 385. a.

Ditto ditto, No. 44.

No. 385. a. Letter from Secretary to the Military Orphan Society, dated 6th January 1837, to Secretary to Government of Bengal, in reply to his Letter of the 2nd ultimo, submits Statements shewing the injurious effect which the new rates of Toll have on the proceeds of the Orphan Gunge or Bazar at Kidderpore.

Ditto ditto, ditto.

No. 386. Letter from Military Board, dated 3rd February 1837, No. 5411, to Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 8th December last and its enclosures.

Ditto ditto, No. 45.

Military Board's
Proceedings, 28th
Feb. 1837, No. 45.

No. 387. Letter from Military Board, dated 3rd February 1837, No. 5412, to the Governor of Bengal, in reply to Mr. Secretary Mangles' Letter of the 20th December last, transmits the Paper marked No. 384, and states, that, under the circumstances noticed in the above Paper, they do not think the Orphan Society have any just ground of complaint, and consequently the Board are not prepared to make any change in the rates of Tollage.

Ditto ditto, ditto.

No. 388. Letter from Military Board, dated 3rd February, 1837, No. 5414, to the Governor of Bengal, replying to Mr. Secretary Mangles' Letter No. 1892, of the 27th December last,

Ditto ditto, ditto.

No. 389. Letter from Secretary to Military Board, dated 3rd February, 1837, No. 5413, to Superintendent of Canals, replying to his Letter of the 29th November last, and directing his attention to certain suggestions for improving the Nullah.

Ditto ditto, No. 46.

No. 390. Letter from Superintendent of Canals, dated 21st February 1837, to the Secretary to Military Board, replying to his Letter No. 5413, of the 3rd instant, and suggesting the means of preserving the [Tolley's] Nullah from the effects of silting, and stating that the Current through the Nullah appears amply sufficient to preserve any depth that may be given to it.

Ditto ditto, No. 49.

No. 391. Letter from Secretary to Military Board, dated 10th February 1837, to the Superintendent of Canals, requesting him to state, what would be the probable effect on Tolley's Nullah if the Navigation from the Hooghly to the Kidderpore Bridge were declared free, and the Toll House were removed to the North of that Bridge, or as far as the Allipore Bridge.

Ditto ditto, No. 50.

No. 392. Letter from Superintendent of Canals, dated 20th February 1837, to Secretary to Military Board, replying to his Letter of the 10th instant marked No. 391.

Ditto ditto, No. 51.

No. 393. Letter from Military Board, dated 28th February 1837, to the Governor of Bengal, in continuation of their Letters No. 5411, and 5412 of the 3rd instant, transmits the Paper marked No. 392, and state that they would not recommend at present modifying in particular localities the existing rates of Toll on Tolley's Nullah.

Ditto 3rd March
1837, No. 21.

No. 394. Letter from Superintendent of Canals, dated 27th February 1837, to Secretary to Military Board, in reply to his Letter No. 5179 of the 27th ultimo, states, that he intends to restrict the charge made by the Farmers of the Canal Ferries to 10 Gundah of Cowries, or $\frac{1}{4}$ of the present charge for each foot passenger.

- No. 395. Letter from Superintendent of Canals, dated 4th February 1837, to Secretary to Military Board, transmitting Plan and Estimate of the Docks proposed to be made at the Salt Water Lakes, to prevent the Navigation of the Canals being obstructed, and stating, that Boats entering the Docks will be charged with the usual Toll; but that no charge will be made for Ground occupied by Goods, unless they should be there more than one year; that he proposes to make the Lock Gates to the Docks of the same breadth as those to the Chitpore Lock, in order that the Lock Dam of the latter may fit that of the former.
- No. 396. Letter from Secretary to Military Board, dated 3rd March 1837, to Superintendent of Canals, in reply to his Letter of the 4th ultimo, requests more detailed information relative to the proposed Balliaghatta Docks. Ditto ditto, ditto.
- No. 397. Letter from Superintendent of Canals, dated 8th March 1837, to Secretary to Military Board, furnishing the information requested in the Secretary's Letter of the 3rd instant. Ditto ditto, ditto.
- No. 398. Letter from Military Board, dated 7th April 1837, to Governor of Bengal, transmitting the Papers marked No. 395, and No. 397, and recommending that the Superintendent of Canals' Estimate for the Docks at Chingreehatta, amounting after correction, to Rupees 21,474 : 5 : 6, be sanctioned. Ditto ditto, ditto.
- No. 399. Letter from Superintending Engineer, L. P., dated 28th July 1836, to Secretary to Military Board, transmitting the Paper marked No. 399. a. Ditto 14th April 1837, No. 37.
- No. 399. a. Letter from Superintendent of Canals, dated 16th July 1836, to Superintending Engineer, L. P., reporting on the state of the Soondurbun Canals and Lake Channel. Ditto ditto, ditto.
- No. 400. Letter from Military Board, dated 9th September 1836, to the Governor of Bengal, transmitting the Papers marked No. 399, and No. 399. a. Ditto ditto, No.
- No. 401. Letter from Secretary to Military Board, dated 9th September 1836, to the Superintending Engineer, L. P., in reply to his Letter of the 28th July 1836, states, that the Board will await the receipt of Estimates on the several Works proposed to be executed by that Officer, and that the Board will be glad to receive fuller explanation on the cause of the Current running up the Lake Channel an hour after High Water. Ditto ditto, No. 39.
- No. 402. Letter from Superintending Engineer, L. P., dated 27th September 1836, to Secretary to Military Board, transmitting the Paper marked No. 402. a. Ditto ditto, No. 42.

Military Board's Proceedings, 14th April 1837, No. 43.	No. 402. <i>a.</i> Letter from Superintendent of Canals, dated 29th August 1836, to Superintending Engineer, L. P., transmitting an Estimate amounting to Rs. 5,414, of the expense of Damming up the Gobrah Khaul, with observations detailing the manner of executing the Work.
Ditto ditto, No. 40.	No. 403. Letter from Superintending Engineer, L. P., dated 24th October 1836, to Secretary to Military Board, transmitting the Paper marked No. 403. <i>a.</i>
Ditto ditto, No. 41.	No. 403. <i>a.</i> Letter from Superintendent of Canals, dated 24th September 1836, to Superintending Engineer, L. P., transmitting the information requested in the Military Board's Letter of the 28th July 1836, to the Superintending Engineer, marked No. 401.
Ditto ditto, No. 44.	No. 404. Letter from Military Board, dated 25th October 1836, to Superintending Engineer, L. P., requesting him to direct the Superintendent of Canals, to furnish a section of the Gobrah Khaul, and Plan and Section of the Dam which he proposes to construct.
Ditto 28th April 1837, No. 43.	No. 405. Letter from Superintendent of Canals, dated 18th February 1837, to Secretary to Military Board, reporting on the extent of the Surplus Land on the Banks of the Circular Canal, and the Rent derived therefrom, with suggestions.
Ditto ditto, No. 44.	No. 405. <i>a.</i> Rates at which the Ground is let on the East Bank of the Circular Canal.
Ditto ditto, ditto.	No. 405. <i>b.</i> Ditto ditto, on the West Bank of the Circular Canal.
Ditto ditto, No. 45.	No. 406. Letter from Secretary to Military Board, No. 5928, dated 24th February 1837, to Superintendent of Canals, in reply to his Letter of the 18th instant, requests him to furnish a Statement, exhibiting the name of the renters, situation, and size of each lot; the terms and date of rental, the length of lease, and the date of its expiration.
Ditto ditto, No. * NOTE.—This information consists of 3 sets of Plans, numbered 110 to No. 118.—J. M.	No. 407. Letter from Superintendent of Canals, dated 15th March 1837, to Secretary to Military Board, transmitting the information* required in his Letter No. 5928, of the 24th ultimo.
Ditto 16th May 1837, No. 21.	No. 408. Letter from Secretary to Government of Bengal, dated 7th March 1837, to Military Board, transmitting the Paper marked No. 408, <i>a.</i> and replying to Board's Letters Nos. 5411, 5412, and 5414, of the 3rd, and 5956, of the 28th February 1837; concurring with them, that no partial change of system should be made respecting the Tollage and Collection, and requesting that the several Petitioners, and the Managers of the

Orphan Society be informed accordingly. The case of Messrs. Carr, Tagore and Co. will be referred for consideration to the General Department, and directing that a Report may be furnished half-yearly relative to the produce of Tolls, &c. ..

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| <p>No. 408 a. Letter from Superintendent of Canals, dated 3rd March 1837, to Secretary to Government of Bengal, stating, that as no remuneration will be granted to him for the trouble of taking charge of the Canal Lands, requests that the same may be transferred to the Collector, as was recommended by the Military Board 4 or 5 years ago.</p> | <p>Military Board's Proceedings, 16th May 1837, No. 22.</p> |
| <p>No. 409 Letter from Military Board, dated 31st March 1837, to the Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 7th instant, and recommending that a temporary addition be made to the Salary of the Superintendent of Canals whilst the Tolls are confided to his charge.</p> | <p>Ditto ditto, No. 23.</p> |
| <p>No. 410. Letter from Secretary to Government of Bengal, dated 11th April 1837, to the Military Board, replying to their Letter of the 31st ultimo, and requesting a report on the New system of Canal Management, and the results, Financial and General, of that system.</p> | <p>Ditto ditto, No. 25.</p> |
| <p>No. 411. Letter from Secretary to Military Board, dated 14th April 1837, to Superintendent of Canals, requesting him to submit a Statement of the gross amount of Tolls collected on the Calcutta Canals, since the 1st of November last, the expense of Collection and the Net Proceeds of the Toll.</p> | <p>Ditto ditto, No. 24.</p> |
| <p>No. 412. Letter from Superintendent of Canals, dated 4th May 1837, to Secretary to Military Board, in reply to his Letter of the 14th ultimo, reports on the Canal Tolls, and transmits the Papers marked No. 412. a. to No. 412. c. inclusive.</p> | <p>Ditto ditto, No. 27.</p> |
| <p>No. 412. a. Statement of the Gross and Net Collection of the Tolls, during the past 6 months, from 1st November 1836, to 30th April 1837.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 412. b. Abstract detailing the Expenditure of Collection, &c. ..</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 412 c. Analysis of the Tolls collected in Tolley's Nullah during October 1836.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 413. Letter from Secretary to Military Board, dated 5th May 1837, to Superintendent of Canals, requesting him to furnish the Number and Tonnage of Boats that have passed into the Circular Canal and Tolley's Nullah, since the Fiscal Duties of those Canals have been committed to his control.</p> | <p>Ditto ditto, No. 26.</p> |

Military Board's
Proceedings, 16th
May 1837, No. 28.

No. 414. Letter from Superintendent of Canals, dated 6th May 1837, to Secretary to Military Board, stating, that he has made no inquiry respecting the lading of Boats that have entered the Canals, but that the number of Boats that entered Tolley's Nullah was 20,030, average burden 305 maunds, and the number that entered the Balliaghatta and Circular Canals was 29,720, average burden of each 150 maunds.

Ditto ditto, No. 8. No. 415. Letter from Secretary to Government of Bengal, dated 9th May 1837, to the Military Board, in reply to Board's Letter of the 7th ultimo, and its enclosures, approves of the proposal to excavate the Docks at Chingreehatta on the Salt Water Lake, capable of holding Boats of the largest class, but considers a Dock from 150 to 200 Boats quite sufficient; and states, that the Government understands that a part of the site of the proposed Docks is occupied by the Fish Market, in which case a suitable piece of Land for a Market should be provided at the expense of Government.

Ditto ditto, No. 9. No. 416. Letter from Secretary to Military Board, dated 16th May 1837, to Superintending Engineer, L. P., transmitting the Paper marked No. 415, and requesting him to instruct the Superintendent of Canals, to take measures for carrying the wishes of Government into immediate effect.

Ditto ditto, No. 29. No. 417. Letter from Military Board, dated 16th May 1837, No. 289, to the Government of Bengal, reporting on the general results of Canal Management, established by the Regulation, dated 1st November 1836.

Ditto 9th June 1837, No. 10. No. 418. Letter from Secretary to Government of Bengal, dated 30th May 1837, to Military Board, in reply to their Letter of the 16th instant, considers the report of the results of the new system of Canal Management very satisfactory, and which it is desirable should continue, inasmuch as the increase produce of Tolls will serve to cover the expenses for improving the several lines of Navigation, and the works already sanctioned, or which may hereafter appear expedient; a temporary addition of Rupees 150 to the Salary of the Superintendent is allowed, and requests at the end of the year, a further Report.

Ditto 20th June 1837, No. .. No. 419. Letter from Secretary to Military Board, dated 9th June 1837, to the Superintending Engineer, L. P., transmitting for his Report, a Petition from certain inhabitants of Intally, requesting the restoration of the Road on the South side of the Intally Canal.

Ditto ditto, No. 20. No. 420. Letter from Superintending Engineer, L. P., dated 15th June 1837, to Secretary to Military Board, in reply to his Letter

No. 806, of the 9th instant, states, that the Petitioners appear to have no just grounds of complaint against the Superintendent of Canals, for the only houses which have entrances towards the Canal, are those situated within about 800 feet Westward of the Kooleah Bridge, and opposite to these, there is a breadth of from 10 to 15 feet of Road; that when the Intally Canal was cut in 1815, there were Roads left on each side, but parts of which were cut away from time to time to give a greater slope to the Canal Banks.

No. 421. Letter from Secretary to Military Board, dated 20th June 1837, to Superintending Engineer, L. P., stating, that the Board rely on the Superintendent of Canals, for keeping the 800 feet of Road on the South Bank of the Canal, West of the Kooleah Bridge, in a good state.

Military Board's
Proceedings, 20th
June 1837, No. 20.

No. 422. Letter from Superintending Engineer, L. P., dated 29th May 1837, to Secretary to Military Board, transmitting an Annual Report on the Canals by the Superintendent of Canals, marked No. 422. a., and stating, that no arrangements it appears have yet been brought forward respecting the Town Drains; but this can only be effectually done in *conjunction* with the *Conservancy Department* and *Fever Hospital and Municipal Committee*, who he understands have already directed their attention to this important subject, on which it will be useless to speculate until the result of their labour is known, and some definite Plan prepared for Draining the Town, that shall not interfere, as it has hitherto done, with the Navigation of the Circular Canal.

Ditto 23rd June
1837, No. 22.

No. 422. a. Letter from Superintendent of Canals, dated 16th May 1837, to the Superintending Engineer, L. P., reporting generally on the Circular and Balliaghatta Canals and Tolley's Nullah, and stating, that the benefit these Canals would derive by closing the Drains leading into them, would exceed 3,000 Rupees a-year; and as the Governor of Bengal has declared that the Tolls derived from the Canals should be devoted to the improvement of them, it has settled in his mind the expediency of keeping up the Soondurbun line of Navigation; and remarking, that the most favorable months for undertaking excavations in Tolley's Nullah, is April, May, and part of June. . .

Ditto ditto, ditto.

No. 423. Letter from Secretary to Military Board, dated 23rd June 1837, No. 1057, to Superintending Engineer, L. P., in reply to his Letter of the 29th ultimo, states, that the Board can hardly believe that the Superintendent of Canals has seriously contemplated the effects of his proposition for blocking up the mouths of the Calcutta Drains, without devising any other mode of carrying off the Drainage of the Town.

Ditto ditto, No. 24.

Military Board's Proceedings, 23rd June 1837, No. 24.	No. 424. Letter No. 1059, from Military Board, dated 23rd June 1837, to the Governor of Bengal, transmitting, with observations, the Paper marked No. 422. <i>a.</i>
Ditto 27th June 1837, No. 55.	No. 424½. Letter from Superintendent of Canals, dated 4th March 1837, to Superintending Engineer, L. P., transmitting an Original and Revised Bill for repairing the Pucka Road of the Western Bank of the Circular Canal, amounting to Rs. 2,512 : 4 : 9. ..
Ditto 4th July 1837, No. 28.	No. 425. Letter from Superintendent of Canals, dated 14th June 1837, to Secretary to Military Board, relative to the payment of Toll by Boats hired by the Commissariat Department passing through Tolley's Nullah, and stating, the difficulties which arise from Boats being permitted to pass without Tickets under any circumstance.
Ditto ditto, No.	No. 426. Letter from Secretary to Military Board, dated 16th June 1837, to Commissary General, requesting him to state if any objection exists to his giving a Ticket to the Boats employed by the Commissariat passing through the Canals.
Ditto ditto, No. 29.	No. 427. Letter from Commissary General, dated 21st June 1837, to Secretary to Military Board, stating, that the suggestion that Tickets should be furnished to all Fleet Manjees, or Manjees of single Boats employed by the Commissariat, appears to offer the most simple and convenient Plan that can be adopted, and that if the Board concur, he will give the necessary instructions to carry it into effect.
Ditto 18th July 1837, No. 7.	No. 428. Letter from Secretary to the Government of Bengal, dated 11th July 1837, to Military Board, in reply to their Letter No. 1059 of the 23rd June 1837, authorizes the Disbursement of Rupees 800 for digging out the Dhurumtollah Cess Pool, and of 900 Rupees, for clearing and repairing the Tow-paths along the Soonderbun Canals.
Ditto 21st July 1837, No. 77.	No. 429. Letter from Superintending Engineer, L. P., dated 28th June 1837, to Secretary to Military Board, transmitting the Paper marked No. 429. <i>a.</i> and No. 429, <i>a.</i> ⁽¹⁾ .. .
Ditto ditto, ditto.	No. 429. <i>a.</i> Letter from Superintendent of Canals, dated 26th June 1837, to the Superintending Engineer, L. P., transmitting the Paper marked No. 429. <i>a.</i> , ⁽¹⁾ and stating, that according to section 2, Regulation I. of 1824, he has taken possession of the Land for the proposed Docks at Balliaghatta, and observes, that it could be shown that the value of the ground is less than 4 annas a biggah per annum, but that the Zemindars will not take less than 1/8 Annas per biggah per annum, as this has been given to them by the Collector of the 24-Per.

gunnabs as Arbitrator, appointed by the Board of Salt and Customs, to settle the value of the ground occupied by the Balliaghatta Salt Works—under the above circumstances, suggests that the Ground required be only rented and not purchased.

- No. 429. a.⁽¹⁾ Letter from the Board of Customs, Salt and Opium, dated 20th June 1837, to the Superintendent of Canals, transmitting Copy of a Letter with its enclosure from the Salt Agent of the 24-Pergunnabs, dated the 6th June last, stating, that the Rent of the Ground occupied by Mr. Prinsep's Salt Works at Balliaghatta, was fixed by Arbitration at 1/8 per Biggah, and that the original award of the Arbitrators it is presumed can be obtained from the Collector of 24-Pergunnabs.

Military Board's
Proceedings, 21st
July 1837, No. 77.

- No. 430. Letter from Secretary to Military Board, dated 21st July 1837, to the Superintending Engineer, L. P., stating, that the Board prefer purchasing to renting the Land required for the Balliaghatta Docks.

- No. 431. Letter from Superintendent of Canals, dated 10th July 1837, to Secretary to Military Board, stating the consequences likely to arise from letting the Circular Canal Lands in the manner directed in his Letter No. 1146, of the 27th June last. ..

Ditto 25th July
1837, No. 29.

- No. 432. Letter from Secretary to Military Board, dated 25th July 1837, to Superintendent of Canals, in reply to his Letter of the 10th instant, states, that the Board do not consider that sufficient grounds exist to render a departure necessary from the Orders sanctioned by Government, and already communicated to him respecting the letting, &c. of the Land on the Bank of the Circular Canal.

Ditto ditto, ditto.

- No. 433. Letter from Military Board, dated 8th August 1837, to the Governor of Bengal, recommending the construction in India, at a cost of 18,200 Rupees of the Iron Vessel, required for the reception of the Steam Machinery of the dismantled Dredging Boat, instead of indenting for it upon the Honorable Court of Directors.

Ditto 8th August
1837, No.

- No. 434. Letter from Superintending Engineer, L. P., dated 8th July 1837, to Secretary to Military Board, transmitting a Bill, amounting to Rupees 3,013 : 6 : 11, for constructing four Toll Houses on the Banks of the Canals.

Ditto 11th August
1837, No. 35.

- No. 435. Letter from Superintendent of Canals, dated 21st July 1837, to Superintending Engineer, L. P., stating, that the only way of ascertaining the price at which the Land required for the Balliaghatta Docks may be obtained, is, by making an offer of the

Ditto ditto, No. 28

highest sum which the Board would recommend the Government to pay, and in case that sum is declined, the price be ascertained by arbitration; that the Land is not worth more than 5 Rupees per Biggah, or Rupees 750 for 150 Biggahs; that Land similar to that required for the Docks is, by the Commissioner of the Soonderbuns, considered of no value, and that nothing was paid for the Land for the Baminghatta Canal. ..

Military Board's
Proceedings, 11th
August 1837, No.
29.

No. 436. Letter from the Superintendent of Canals, dated 3rd August 1837, to the Superintending Engineer, L. P., stating, in explanation of his Letter No. 32, that his Estimate No. 6, of the 16th March 1837, for forming the Balliaghatta Docks is composed of three items,—viz. the purchase of Ground; the construction of a Tide Lock or Sluice; and the excavation of Docks for 400 Boats, amounting in all to Rs. 21,500; but as he was since limited to a sum of 10,000 Rupees to construct the Lock, and make Docks for 150 Boats, he suggested that, as the Ground might cost 4,000 Rupees, and the Lock, Rupees 5,000, the latter should not be constructed till the 1st and 2nd years—but the money remaining, after paying for the Ground, should be expended in excavating the Docks.

Ditto ditto, No.

No. 437. Letter from Secretary to Military Board, dated 11th August 1837, to Superintending Engineer, L. P., requesting him to direct the Superintendent of Canals to offer to the Proprietors of the Land required for the Balliaghatta Docks, the sum of Rupees 2,500.

Ditto 15th August
1837, No. 15.

No. 438. Letter from Superintendent of Canals, dated 24th July 1837, to Secretary to Military Board, stating the probable annual cost of Dredging the Canals.

Ditto ditto, No. 43.

No. 439. Letter from Superintendent of Canals, dated 29th July 1837, to Secretary to Military Board, transmitting a Draft of an Agreement for farming the Circular Canal Land.

Ditto ditto, No. 16.

No. 440. Letter from Secretary to Military Board, dated 15th August 1837, to Superintending Engineer, L. P., transmitting the Paper marked No. 438, and requesting him to direct the Superintendent of Canals to furnish information as to the extent of Dredging that will be required to keep the Canals clean, and the data upon which he founds his calculations.

Ditto 25th August
1837, No. 53.

No. 441. Letter from Secretary to Military Board, dated 30th June 1837, to the Superintendent of Canals, requesting him to furnish a Statement, shewing the average Number and Tonnage of Boats which have passed through the Circular Canal daily, since 1st November 1836, and the greatest number that could be passed, when, from the height of the River, it becomes necessary to keep the Lock Gates closed.

PAGE.

- No. 442. Letter from Superintending Engineer, L. P., dated 14th July 1837, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in making Tow-paths in the Salt Water Lake, and completing the Bund, cutting Jungle, making Bridges, &c. amounting to Co.'s Rupees 4,410 : 3 : 4.
- Military Board's
Proceedings, 25th
August 1837, No.
53.
- No. 443. Letter from Superintending Engineer, L. P., dated 29th July 1837, to Secretary to Military Board, in reply to his Letter of the 23rd ultimo, No. 1057, relative to the Superintendent of Canals' last Annual Report of the 16th May 1837, transmits, with observations, the Paper marked No. 443, a., and submits an Estimate amounting to Rupees 1,081 : 4 : 0, of the probable expense of clearing out the Dhurumtollah Cess Pool. ..
- Ditto ditto, No. 40.
- No. 443. a. Letter from Superintendent of Canals, dated 17th July 1837, to Superintending Engineer, L. P., replying to the Military Board's Letter No. 1057, on the subject of the Superintendent's last Annual Report.
- Ditto ditto, ditto.
- No. 444. Letter from Secretary to Military Board, dated 25th August 1837, to the Superintending Engineer, L. P., referring to his Letter of the 29th ultimo, requests him to direct the Superintendent of Canals to clean out the Dhurumtollah Cess Pool, and charge the expense of the same in his Bill.
- Ditto ditto, No.
- No. 445. Letter from Military Board, dated 25th August 1837, to the Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 442, and recommending that it be passed, and explaining the cause of its excess above the amount of the Estimate (Co.'s Rupees 3,495 : 5 : 4,) sanctioned by the Government on the 19th August, 1835.
- Ditto ditto, ditto.
- No. 446. Letter from Secretary to Military Board, dated 25th August 1837, to Superintending Engineer, L. P., in reply to his Letter No. 1636 of the 22nd instant, states, that the Agent of the Proprietors of the Land, required for the Balliaghatta Docks, has accepted Rupees 2,500 for the Land; and that it appears there is no reason for any further discussion on the point. ..
- Ditto ditto, No. 13.
- No. 447. Letter from Secretary to Government, dated 9th May 1837, to Military Board, transmitting the Paper marked No. 447. a., and calling for a special Report upon the present condition of the Eastern and Circular Canals, with special reference to the points adverted to by the Honorable Court.
- Ditto 29th August
1837, No. 33.
- No. 447. a. Despatch, dated 18th January 1837, from the Honorable Court of Directors to the address of the Government of India, respecting the operations on the Eastern and Circular Canals.
- Ditto ditto, ditto.

Military Board's Proceedings, 29th August 1837, No. 35.	No. 448. Letter from Superintendent of Canals, dated 8th July 1837, to Officiating Secretary to Military Board, transmitting the Pa- pers marked No. 448, <i>a.</i> to No. 448, <i>e.</i> inclusive, shewing the average Number and Tonnage of Boats which have passed through the Circular Canal, with information relative to the Chitpore Lock Gates, and Cess Pool at the head of the Dhur- runtollah Drain, &c.
Ditto ditto, ditto.	No. 448. <i>a.</i> Abstract Comparative Statement of the Number of Boats that passed through the Chitpore Lock Gates when they were open and shut.
Ditto ditto, ditto.	No. 448. <i>b.</i> Table shewing the monthly Number of Boats that have pas- sed through the Chitpore Locks, from 1833 to 1837 inclusive.
Ditto ditto, ditto.	No. 448. <i>c.</i> A Return of the Boats which have entered at Dhapah and Chitpore in April 1837, and which have since passed out. . .
Ditto ditto, ditto.	No. 448. <i>d.</i> Register of the opening and shutting of Lock Gates, from 1st of August 1835 to 1st March 1837.
Ditto ditto, ditto.	No. 448. <i>e.</i> Table of the calculated velocities of the Water in the Cir- cular Canal at various heights of the Tide in the River. . .
Ditto ditto, No. 36.	No. 449. Letter from Military Board, dated 29th August 1837, to the Governor of Bengal, in reply to his Letter of the 9th May 1837, marked No. 447, transmits the Papers marked No. 448. and No. 448. <i>a.</i> to No. 448, <i>e.</i> inclusive.
Ditto 5th Septem- ber 1837, No. 67.	No. 450. Letter from Superintending Engineer, L. P., dated 8th July 1837, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 453 : 15 : 6, for digging out the Dhurruntollah Cess Pool, also a Bill for making and repairing the Soondurbun Tow-paths, amounting to Rupees 1,092 : 15 : 6.
Ditto ditto, No.	No. 451. Letter from Military Board, dated 5th September 1837, to the Governor of Bengal, transmitting the first of the two Bills re- ferred to in the Paper marked No. 450, and recommending that it be passed.
Ditto 15th Septem- ber 1837, No. 45.	No. 452. Letter from the Superintendent of Canals, dated 6th September 1837, to Superintending Engineer, L. P., reporting on the state of the Kooleah Bridge, and stating, that it could not be recon- structed on a large scale without injuring the Bazars on both its sides.
Ditto 17th October 1837, No. 66.	No. 453. Letter from Superintending Engineer, L. P., dated 28th August 1837, to Secretary to Military Board, in reply to his Letter of

the 15th instant marked No. 440, transmits the Paper marked
No. 453. *a.*

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| <p>No. 453. <i>a.</i> Letter from Superintendent of Canals, dated 24th August 1837, to Superintending Engineer, L. P., replying to Military Board's Letter of the 15th instant, to the address of the Superintending Engineer.</p> | <p>Military Board's
Proceedings, 17th
October 1837, No.
66.</p> |
| <p>No. 454. Letter from Secretary to Government of Bengal, dated 26th September 1837, to Military Board, transmitting the Paper marked No. 454, <i>a.</i> and requesting a Report thereon.</p> | <p>Ditto 31st October
1837, No. 24.</p> |
| <p>No. 454. <i>a.</i> Petition from certain Merchants and Traders of Bengal, complaining of the present mode of Collecting Tolls on Tolley's Nullah.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 455. Letter from Secretary to Military Board, dated 3rd October 1837, to Superintendent of Canals, transmitting the Papers marked No. 454, and No. 454, <i>a.</i>, and requesting his opinion thereon.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 456. Letter from Superintendent of Canals, dated 16th October 1837, to the Secretary to Military Board, replying to his Letter of the 3rd instant, marked No. 455.</p> | <p>Ditto ditto, No. 25.</p> |
| <p>No. 457. Letter from the Military Board, dated 31st October 1837, to the Deputy Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 26th ultimo, and transmitting the Paper marked No. 456.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 458. Letter from Superintendent of Canals, dated 11th November 1837, to Secretary to Military Board, transmitting an Authenticated Copy of the Mooktearnamah, granted by the Zemindars having claims on the Salt Water Lakes, to Hurroopersaud Bannerjia, to receive Rupees 2,500, the purchase money of 150 Biggahs of Ground bought for the Balliaghatta Docks.</p> | <p>Ditto 17th November
1837, No. 18.</p> |
| <p>No. 459. Letter from Superintendent of Canals, dated 11th December 1837, to Secretary to Military Board, transmitting the Papers marked No. 459. <i>a.</i> and No. 459. <i>b.</i> and stating, that the nett Collections ending 31st October 1837, of the Toll on the Calcutta Canals amount after correction, to Rs. 1,68,150 : 0 : 7.</p> | <p>Ditto 2nd January
1838, No. 9.</p> |
| <p>No. 459. <i>a.</i> Detailed Statement of the expense of collecting the Tolls on the Circular Canal and Tolley's Nullah, from 1st of November 1836 to 1st November 1837.</p> | <p>Ditto ditto, No. 10.</p> |

Military Board's
Proceedings, 2nd
Jan. 1838, No. 11.

No. 459. *b.* Annual account current of Toll Collections realised from Circular Canal, &c. and the Disbursements made therefrom during the half year, commencing 1st of November 1836.

Ditto 16th February 1838, No.

No. 460. Letter from Military Board, dated 6th February 1838, to the Deputy Governor of Bengal, submitting a Bill by the Superintendent of Canals, amounting to Co.'s Rs. 4,022:7:10, being Rs. 822, in excess of Estimate for cutting down, levelling and repairing the Slopes and Drains of the Balleaghatta Canal, as recommended in Board's Letter, No. 4546, of the 15th December 1835.

Ditto 2nd March 1838, No. 40.

No. 461. Letter from Superintending Engineer, L. P., dated 24th January 1838, to the Secretary to Military Board, transmitting a Bill, No. 43, by the Superintendent of Canals, amounting to Rs. 636:9:3, for expense incurred in digging out the Dhurumtollah Cess Pool.

Ditto 27th March 1838, No. 9.

No. 462. Letter from Secretary to Government, dated 20th March 1838, to the Military Board, in reply to their Letter No. 6283 of the 13th instant, states, that instructions have been issued to the Accountant General to place at the disposal of the Superintending Engineer, S. W. P. an advance of Co.'s Rs. 2,500, for the purchase of ground for the Balleaghattah Docks.

Ditto 17th April 1838, No. 62.

No. 463. Letter from Superintendent of Canals, dated 10th April 1838, to Secretary to Military Board, reporting, that a strong wind on Sunday last, passed across Tolly's Nullah near Paustolah, and the Eastern end of the Balleaghattah Canal, and destroyed in its track all the houses, trees and boats, except the Dhapa Toll-house, which is only partially damaged, and many lives; and that the Navigation of both Canals has been stopped by sunken boats, but that means have been adopted for removing these boats.

Ditto 1st May 1838, No. 33.

No. 464. Letter from Superintendent of Canals, dated 19th March 1838, to the Superintending Engineer, S. W. P., in reply to his Letter of the 14th instant relative to Bill No. 31, for repairs made to the Road, Banks and Drains of the Balleaghattah Canal, explains the nature of the work, and the circumstances attending the execution of it.

No. 465. Letter from Military Board, dated 1st May 1838, to Deputy Governor of Bengal, with reference to Mr. Secretary Halliday's Letter of the 27th February last, requesting a clear explanation of the cause of the Bill referred to in the Paper marked No. 460, exceeding the Estimate, transmits the Paper marked No. 465, and recommends that the Bill be passed.

- No. 466. Letter from Officiating Secretary to Government of Bengal, dated 7th November 1837, to the Military Board, transmitting for report a Petition from Goroodoss Dutt and Deegambur Mookerjee, offering to farm the Tolls of the Circular Canals for the sum of Rupees 1,80,000 per annum, which sum they propose to pay by monthly instalments of Rupees 15,000, and tender Security.
- Military Board's
Proceedings, 1st
May 1838, No. 62.
- No. 467. Letter from Superintendent of Canals, dated 8th November 1837, to Secretary to Military Board, stating, that the Collection of Tolls has now been twelve months under his charge, he accordingly reports on the same, and transmits the Paper marked No. 467. *a*.
- Ditto ditto, No. 63.
- No. 467. *a*. Statement of the gross and net Collection of the Tolls on the Canals, from 1st of May to 31st October 1837, by the Superintendent of Canals.
- Ditto ditto, No. 64.
- No. 468. Letter from Military Board, dated 28th November 1837, to the Deputy Governor of Bengal, with reference to Mr. Secretary Mangles' Letter of the 30th May last, reporting on the general operations of the Toll Collections of the Calcutta Canals for the past year, from 1st November 1836 to 1st November 1837, during which period the new rates and system of Tollage have been enforced, and transmitting the Papers marked No. 467, No. 467, *a*. and No. 468, *a*. to No. 468, *f*.
- Ditto ditto, No. 65.
- No. 468. *a*. Statement of the gross Revenue derived from the Canals, from November 1836 to October 1837, amounting to Rupees 1,82,809.
- Ditto ditto, No. 66.
- No. 468. *b*. Statement of the expenses attendant on the Toll Collection and Conservancy, amounting to Rupees 7,156 : 6 : 7.
- Ditto ditto, ditto.
- No. 468. *c*. Statement of Establishment and Petty Repairs, and Salary of Superintendent of Canals, amounting to Rupees 11,346 : 8 : 10.
- Ditto ditto, ditto.
- No. 468. *d*. Statement of expense on account of Dredging, amounting to Rupees 2,863 : 2 : 11½.
- Ditto ditto, ditto.
- No. 468. *e*. Statement of Estimates sanctioned during the year 1837, amounting to Rupees 45,739 : 4 : 5.
- Ditto ditto, ditto.
- No. 468. *f*. Bills for heavy Annual Repairs, amounting to Rs. 5,620 : 14 : 0.
- Ditto ditto, ditto.
- No. 469. Letter from the Officiating Secretary to Government of Bengal, dated 19th December 1837, to Military Board, stating, that the Government previously to passing orders on the Board's Report of the 28th ultimo on the general operations of the Toll
- Ditto ditto, No. 67.

Collections on the Calcutta Canals, from 1st November 1836 to 1st November 1837, requests to be furnished with a Statement exhibiting the proportion of the gross Revenue from the Canals which has been realized from empty Boats generally, and the amount collected from empty Firewood Boats generally.

Military Board's
Proceedings, 1st
May 1838, No.

- No. 470. Letter from Secretary to Military Board, dated 26th December 1837, to Superintendent of Canals, transmitting Copy of the Paper marked No. 469, and requesting him to furnish the information desired in the same.
- Ditto ditto, No. 68. No. 471. Letter from Superintendent of Canals, dated 30th December 1837, to Secretary to Military Board, in reply to his Letter of the 26th instant, states, that there are no Returns or Documents in his Office which would enable him to furnish the information required, but hazards an opinion on the subject.
- Ditto ditto, No. 69. No. 472. Letter from Military Board, dated 5th January 1838, to the Governor of Bengal, replying to the Letter of the Officiating Secretary to the Government of Bengal, dated 19th December 1837, and transmitting the Paper marked No. 471.
- Ditto ditto, No. 70. No. 473. Letter from Officiating Secretary, to Government of Bengal, dated 24th April 1838, in reply to Board's Letters of 31st October and 28th November 1837, and 5th January 1838, transmits the Papers marked No. 473. *a.* and No. 473. *b.*
- Ditto ditto, No. 71. No. 473. *a.* Copy of a Resolution passed by the Deputy Governor of Bengal, on the 24th April 1838, regarding the Tolls levied on the Calcutta Canals, and reducing from 1st May 1838, the Tolls on the same to one-half of their former rate, or 8 annas per 100 maunds.
- Ditto ditto, No. 72. No. 473. *b.* Notification, dated 24th April 1838, of the new rates of Toll on the Calcutta Canals, to take effect from 1st May 1838.
- Ditto, 15th May 1838, No. 12. No. 474. Letter from Officiating Secretary to Government of Bengal, dated 17th April 1838, to Military Board, transmitting the Papers marked No. 474. *a.* to No. 474. *f.* inclusive, and requesting them to state, whether a general order for the exemption of Boats laden with Government property from the payment of the Toll leviable on all Boats passing through or into the Canals, specified in Act No. XXII, of 1836, will be productive of any injurious effect upon the Collections, by affording opportunity to the Native Collectors for embezzlement or extortion or otherwise; that if the measure would be productive of inconvenience, the Board will be pleased to state how the best mode of remitting the Toll might be carried into effect.

(*Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the General Department, under date 20th March 1838, Comprising the Papers marked No. 474. a. to No. 474. f.*)

Military Board's
Proceedings, 15th
May 1838, No. 13.

- No. 474. a. Letter from Board of Customs, Salt and Opium, dated 23rd March 1838, to Deputy Governor of Bengal, transmitting the Paper marked No. 474. a.(1) &c. and with reference to their Letter of the 26th May 1834, again solicits the remission of the Toll on Boats employed in transporting Salt through the Calcutta Canals to the Sulkea Golahs, as the Superintendent of Canals does not consider himself authorized under the orders of Government in the 4th Paragraph of Mr. Secretary Prinsep's Letter, dated 2nd June 1834, to allow the above Boats to pass free of Impost. Ditto ditto, ditto.
- No. 474. a.(1) Letter from Acting Salt Agent of 24-Pergunnahs, dated 18th July 1837, to the Acting Secretary to the Board of Customs, Salt and Opium, transmitting, with observations, the Papers marked No. 474. a.(1a.) and No. 474. a.(1b.) &c. for the Board's consideration. Ditto ditto, ditto.
- No. 474. a.(1a.) Letter from George Prinsep, Esq., dated 3rd July 1837, to Acting Salt Agent of 24-Pergunnahs, requesting, for the purpose of removing the Salt of the past Season from Balleaghattah to Sulkeah, permission as heretofore, to give Boat Passes under his own signature. Ditto ditto, ditto.
- No. 474. a.(1b.) Letter from Salt Agent of 24-Pergunnahs, dated 3rd July 1837, to Captain J. Thomson, Collector of Canal Tolls, requesting him to order the Officers at the Toll not to detain Boats containing Salt from Mr. Prinsep's Balleaghaut Salt Works in transit to the Sulkea Golahs. Ditto ditto, ditto.
- No. 474. b. Letter from Superintendent of Canals, dated 4th July 1837, to the Salt Agent of 24-Pergunnahs, stating, in reply to his Letter of the 3rd instant, that the Regulations by which he, the Superintendent, is guided, does not allow him any discretion in detaining or permitting to pass free the Boats laden with Government property or otherwise. Ditto ditto, ditto.
- No. 474. c. Extract of a Demi-Official Letter from G. A. Prinsep, Esq., dated 11th July 1837, to the Salt Agent of 24-Pergunnahs, stating that his Boats are waiting at the river mouth of the Canal, and that the business of transporting the Salt in the same is under suspense, and that Captain Thomson has given no orders for their entry. Ditto ditto, ditto.
- No. 474. d. Letter from Salt Agent of 24-Pergunnahs, dated 20th July 1837, to the Superintendent of Canals, with reference to his

Letter of the 4th instant, transmits the Paper marked No. 474. c. and requests him to order Official Passes for the Boats in question, as any accident to them would occasion a heavy loss to Government.

Military Board's
Proceedings, 15th
May 1838, No. 13.

No. 474. e. Letter from Superintendent of Canals, dated 11th July 1837, to the Salt Agent of 24-Pergunnahs, stating that he cannot allow the Boats referred to in his Letter of this day's date, a pass until the regulated Toll is paid.

Ditto ditto, ditto. No. 474. f. Order, dated 28th March 1838, directing, that the Papers marked No. 474. a. to No. 474. e. inclusive, be sent to the Revenue Department, that the necessary instructions may be issued to enable the Board of Customs, Salt and Opium, to convey the Government Salt through the Public Canal, without being subject to Toll, and for the refund of any amount hitherto paid on this account.

Ditto ditto, ditto. No. 475. Letter from Military Board, dated 15th May 1838, to the Deputy Governor of Bengal, in reply to Mr. Officiating Secretary Halliday's Letter of the 17th ultimo, states, that any deviation from the rule under which Toll is at present leviable on Boats in the Canal would, they fear, be productive of extensive abuses, and pointing out a simple method of bringing to account the amount of Toll levied from Government Boats.

Ditto 12th June 1838, No. 33. No. 476. Letter from Superintendent of Canals, dated 14th May 1838, to Secretary to Military Board, transmitting the Papers marked No. 476. a. to No. 476. e. inclusive and reporting on the Toll Collections during the last half year, ending 30th April instant.

Ditto ditto, ditto No. 476. a. Statement of the gross Net Collection of the Tolls on the Canals, from 1st November 1837 to 30th April 1838. ..

Ditto ditto, ditto. No. 476. b. Explanation of the Receipts and Expenditure in the Toll Collection Account, for the half year ending 30th April 1838.

Ditto ditto, ditto. No. 476. c. Amount of current expense Bill in Toll Collection Account, for the half year ending 30th April 1838.

Ditto ditto, ditto. No. 476. d. Comparative Statement of the gross Collections made in the half years, commencing 1st November 1836 and 1837. ..

Ditto ditto, ditto. No. 476. e. Comparative Statement of the Collections made at the different Toll Houses in the half years, commencing 1st November 1836 and 1837.

No. 477. Letter from Military Board, dated 12th June 1838, to the Deputy Governor of Bengal, transmitting the Paper marked No. 476. No. 476. *a.* to No. 476. *e.* inclusive.

Ditto ditto, No. 35.

No. 478. Letter from Superintending Engineer, S. W. P., dated 2nd June 1838, to Secretary to Military Board, transmitting the Papers marked No. 478. *a.* to No. 478. *e.* relative to the termination of the Town Roads on the Circular Canal, and requesting that the above Papers may be laid before the Military Board, and stating that he thinks the public will suffer less inconvenience by the adoption of Lieutenant Abercrombie's views, than by the cessation of the Town Roads at any point on the Town side of the Bridges.

Ditto ditto, No. 36.

No. 478. *a.* Letter from Superintending Engineer, S. W. P., dated 23rd May 1838, to Superintendent of Canals, stating, that Lieut. Abercrombie having pointed out that inconvenience is likely to occur from the cessation of the Town Roads at the Marhatta Ditch, he, the Superintending Engineer, requests to know whether he, the Superintendent, is aware of any objection to the management of these Roads being placed under Lieutenant Abercrombie, as far as the standards of the Bridges nearest the Town.

Ditto ditto, ditto.

No. 478. *b.* Letter from Superintendent of Canals, dated 25th May 1838, to the Superintending Engineer, S. W. P., in reply to his Letter of the 23rd instant, states, that the Plan proposed by Lieut. Abercrombie would cause expense, without any advantage. ..

Ditto ditto, ditto.

No. 478. *c.* Letter from Lieutenant Abercrombie, Superintendent of Roads, dated 17th May 1838, to Superintending Engineer, S. W. P., requesting to be informed, what are to be considered the Northern boundaries of the Roads made over to him by the Military Board in their Letter, No. 3097, of 13th October 1837...

Ditto ditto, ditto

No. 478. *d.* Letter from Superintending Engineer, S. W. P., dated 30th May 1838, to Superintendent of Roads, Calcutta, in reply to his Letter of the 17th instant, transmits the Paper marked No. 478. *b.* and requests his observations on the same. ..

Ditto ditto, ditto.

No. 478. *e.* Letter from Superintendent of Roads, dated 1st June 1838, to Superintending Engineer, S. W. P., replying to his Letter of the 30th ultimo, marked No. 478. *d.*

Ditto ditto, ditto.

No. 479. Letter from Secretary to Military Board, dated 12th June 1838, to Superintending Engineer, S. W. P., in reply to his Letter of the 2nd instant, states, that the Board concur in his views, and direct the suggestions contained in his Letter under reply, be carried into effect. '

Military Board's
Proceedings, 15th
June 1838, No. 51.

No. 480. Letter from Officiating Secretary to the Government of Bengal, dated 15th May 1838, to Military Board, transmitting the Paper marked No. 480. *a*, and its enclosures, and requesting that the Board will report, how it occurs that the Canal Land referred to in the above Paper is not under the management of the Superintendent of Canals.

Ditto ditto, No. 52.

No. 480. *a*. Letter from Officiating Secretary to Sudder Board of Revenue, dated 17th April 1838, to Officiating Secretary to Government of Bengal, transmitting with observations, Letters dated 15th March and 4th April 1838, from the Commissioner of Jessore, with enclosures relative to the remuneration of the person employed to collect the Rents from the plots of Ground belonging to Government, which lie along the banks of the Eastern Canal, and requesting the orders of Government on the above, and remarking, that these collections were formerly made by the Darogah or Collector of Tolls on the Canal ; but on the management of the Canals being separated from the Office of the Calcutta Collectorate, a Tuhseeldar, in January 1837, was appointed expressly for the purpose of collecting these Rents, and recommending that that Officer be placed with respect to his allowance on the same footing as the Tuhseeldars employed in the Collection of Rents in Calcutta and Punchanogram.

Ditto ditto, No.

No. 481. Letter from Military Board, dated 15th June 1838, to Deputy Governor of Bengal, with reference to the Letter of the Officiating Secretary, Mr. Halliday, of the 15th ultimo, states that the Office Records of the Military Board do not afford the means of replying to the Government inquiries, and stating, that if by the New Canal they are to understand the Circular Canal, they are ignorant of any portion of those Lands being, or ever having been, under the Charge of the Civil Authorities ; but if the Lands referred to are those on the sides of the Entally and Balliaghatta Canals, they never were placed under the control of the Canal Committee, or the Military Board, and they are still of opinion, that the Canal Lands would be most advantageously managed by the Superintendent of Canals, were he disposed to undertake that duty in a zealous spirit ; in the absence of which, they would recommend the management of the Canal Lands be transferred to the Deputy Collector of Calcutta.

Ditto 26th June
1838, No. 67.

No. 482. Letter from Superintending Engineer, S. W. P., dated 31st May 1838, to Secretary to Military Board, transmitting a Bill by Captain Thomson, No. 57, for making and repairing Towing-paths in the Soonderbund Canals, for the year 1837-1838, also, with observations, the Papers marked No. 482. *a*. and No. 482. *b*.

No. 482. *a.* Letter from Superintending Engineer, S. W. P., dated 21st May 1838, to Superintendent of Canals, requesting him to mention; first, the total length of the Towing-paths on the Soonderbund Canal; second, whether the expense of their repair has been charged in his Bills, for 1834 to 1837 inclusive, and whether the cost for removing Boats and other obstacles from the Canal were included in the above Bills; third, what length the Towing-path, which is referred to in his Letter of the 27th ultimo, is to be made by the Contractor; fourth, what sum he considers sufficient to pay for keeping up Towing-paths and removing obstacles from the Canal in those parts to which his contract with Mr. Storm does not apply; fifth, what arrangements does he propose for seeing that Mr. Storm, or any other Contractor acts up to his engagement, and how he would enforce it if he does not; sixth, why should his, the Superintendent's, Coolies in the Soonderbunds be paid more than those of other people.

Military Board's
Proceedings, 26th
June 1838, No. 68.

No. 482. *b.* Letter from Superintendent of Canals, dated 23rd May 1838, to Superintending Engineer, S. W. P., replying to his Letter of the 21st instant.

Ditto ditto, ditto.

No. 483. Letter from Secretary to Military Board, dated 26th June 1838, to the Superintending Engineer, S. W. P., requesting him, with reference to the question of a Contract with the Agent of the Soondurbun Grantee, for the maintenance and repair of part of the Soondurbun Tracking-path, to direct the Superintendent of Canals to enter into the necessary Contract, and stating that the Board are of opinion that the Government have a right to the Tow-paths along the Soonderbund Line; but if such should prove not to be the case, the necessary steps should be taken, under existing Regulation, to procure it for the use of the Public.

No. 484. Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the Revenue Department, under date the 3rd July 1838, containing the Resolution passed by the Deputy Governor, directing that the control of the Canal Lands should be placed under the Deputy Collector of Calcutta, instead of being under the management of the Superintendent of Canals.

Ditto 10th July
1838, No. 21.

No. 485. Letter from Secretary to Military Board, dated 10th July 1838, to Superintendent of Canals, transmitting copy of the Paper marked No. 484, and directing the transfer of the Canal Lands, with the Establishment, to the Deputy Collector of Calcutta.

Ditto ditto, No. 22.

No. 486. Letter from Secretary to the Governor of Bengal, dated 10th July 1838, to the Military Board, transmitting the Paper

Ditto, 24th July
1838, No. 14.

marked No. 486. *a*, and requesting, that the necessary order may be issued in accordance with the tenor of the said Paper.

Military Board's
Proceedings, 24th
July 1838, No. 15.

No. 486. *a*. Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the General Department, under date the 27th June 1838, relative to the Salt belonging to the Government not being a fit object upon which to levy Toll on transit through the Canals, and that the prevention of abuse will be sufficiently assured by the Salt Boats paying Toll according to their Tonnage, and Certificates of such payments being granted to the person in charge of the Boats; these Certificates being checked by the Board of Customs, Salt and Opium, by the deliveries at Sulkeah, &c., and the Board to obtain a refund from the Superintendent of Tolls upon Certificates of the number of maunds of Salt delivered under its order. ..

Ditto ditto, No. 16.

No. 487. Letter from Secretary to Military Board, dated 24th July 1838, to Superintendent of Canals, transmitting for his information, Copy of the Paper marked No. 486. *a*.

Ditto, 31st July
1838, No. 23.

No. 488. Letter from the Deputy Collector of Calcutta, dated 25th July 1838, to Secretary to Military Board, requesting to be furnished with Pottahs, Title Deeds, and other Documents connected with the Canal Lands, lately under the control of Captain Thomson.

Ditto ditto, No. 24.

No. 489. Letter from Secretary to Military Board, dated 31st July 1838, to Deputy Collector of Calcutta, in reply to his Letter of the 25th ultimo, states, that all the records, consisting of Plans, Pottahs, and other Title Deeds relative to the Canal Lands, which are in the Military Board Office, will be made over to Mr. Dampier, the Commissioner of the 18th Division, under instructions received from the Sudder Board of Revenue, on that gentleman sending for the above Documents.

Ditto 21st August
1838, No. 35 $\frac{1}{2}$.

See also Revenue
Department, Pro-
ceeding, 23rd Octo-
ber 1838, Nos. 13,
and 14.—J. M.

No. 490. Letter from Military Board, dated 21st August 1838, to Deputy Governor of Bengal, reporting on the progress made in the construction of the Iron Hull required for the reception of the Steam Machinery of the dismantled Dredging Boat.

Ditto 31st August
1838, No. 49.

No. 491. Letter from Superintendent of Canals, dated 3rd July 1838, to Secretary to Military Board, suggesting the expediency of paying the Toll Darogahs, by a per-centage of 4 per cent. on the amount they collect, and assigns his reasons for the above.

Ditto ditto, ditto.

No. 492. Letter from Secretary to Military Board, dated 20th July 1838, to Superintendent of Canals, in reply to his Letter of the 3rd instant, states, that the Board are willing to adopt his pro-

position—but they request he will explain how he means to pay the Darogahs when the Canals are stopped, and transmitting the Paper marked No. 492. a.

- No. 492. a. Letter from Cosseynauth Nundee, dated 4th July 1838, to the Military Board, bringing to their notice certain Mal-practices carried on to the detriment of Government in the management of the Canal duties, by the Aumlas of Captain Thomson.
- Military Board's
Proceedings, 31st
August 1838, No.
50.
- No. 493. Letter from Superintendent of Canals, dated 31st July 1838, to Secretary to Military Board, in reply to his Letter of the 20th instant, suggests, that a Commission of 5, instead of 4 per cent. be granted to the Toll Darogahs, as a remuneration for the amount they collect ; and submits further remarks on the conduct and character of that class of Officers.
- Ditto ditto, No. 51.
- No. 494. Letter from Superintendent of Canals, dated 31st July 1838, to Secretary to Military Board, submitting his observations on the Petition of Cossynauth Nundy, respecting the undue-influence exercised by Ramdhone Ghose in the Office of the Superintendent of Canals, and remarking, that the statements made in the Petition shows that the Petitioner is entirely ignorant of what the duties are of the establishment for the Toll Collection and Canal Department, and of the manner in which those duties are executed.
- Ditto ditto, No. 52.
- No. 495. Letter from Secretary to Military Board, dated 17th August 1838, to Superintendent of Canals, in reply to his Letters, No. 69, and No. 70, of the 31st ultimo, states, that the Board do not see sufficient grounds for making any change in the mode of paying the Darogahs ; and requesting, that the indirect connexion of Ramdhone Ghose with the Toll Collection may be dispensed with.
- Ditto ditto, No. 53.
- No. 496. Letter from Superintendent of Canals, dated 23rd August 1838, to Secretary to Military Board, stating, that the interference of Ramdhone Ghose with the Toll Collections may be dispensed with by requiring the Toll Darogahs to nominate some other person to take charge of the money collected, and transmit it to the Treasury.
- Ditto ditto, No. 54.
- No. 497. Letter from Military Board, dated 31st August 1838, to the Deputy Governor of Bengal, transmitting the Papers marked Nos. 491 to No. 496, inclusive, and recommending, that the Toll Collections be transferred direct to the Revenue Authorities.
- Ditto ditto, No. 55.
- No. 498. Letter from Military Board, dated 24th November 1837, to the Deputy Governor of Bengal, submitting the case of Muddenmohun Ghose's encroachment on Government Ground on the
- Ditto 25th September 1838, No. 65.

Banks of the Circular Canal, and requesting instructions on the line of procedure to be pursued, and remarking, that when the powers of a Magistrate were conferred on the Superintendent of Canals, with a view of preserving the Navigation and repressing encroachments on the Banks of the Canal, the Board concluded, that those powers extended to the narrow strips of land on either Bank of the Canal placed under the Superintendent of Canals' charge, under the denomination of the Circular Canal Land ; there however appears to be some doubt as to the power of the Superintendent of Canals, either to correct encroachments, or to Distrain the property of the Tenant for arrears of Rent on Ground belonging to Government.

Military Board's
Proceedings, 25th
September 1838,
No. 66.

No. 499. Letter from Superintendent of Canals, dated 22nd November 1837, to Secretary to Military Board, stating, that the authority given by the Military Board, to collect the Rents of the Land on the Banks of the Circular Canal, also gave authority to Distrain for it, and that he has acted by the advice of the Commissioner, and that he feels justified that his proceedings while in charge of the above Land have been correct, and that he considers that it would be to the advantage of Government to put these Lands under the charge of the Collector of 24-Pergunnahs, who has the power of adjudicating such cases, and issuing a decree to enforce his orders ; that he understands that these Lands have not been registered in the Civil Offices ; and that his proposal some years ago to the Military Board on this subject was, he believes, rejected ; that on his departure from Calcutta, he apprehends all traces of the boundaries will be lost—insects having injured and partly destroyed the original Maps in his possession.

Ditto ditto, No. 68. No. 500. Letter from Secretary to Government of Bengal, dated 2nd January 1838, to Military Board, in reply to their Letters of the 24th November and 12th December last, respecting the case of Muddunmohun Ghose, desires more information on the subject, and to know whether it is expedient, with reference to other like cases, for the Government to maintain its rights before a Civil Tribunal.

Ditto ditto, No. 77. No. 501. Letter from Military Board, dated 9th March 1838, to the Deputy Governor of Bengal, replying to Mr. Officiating Secretary Halliday's Letter of 2nd January 1838, marked No. 500. . .

Ditto ditto, No. 78. No. 502. Letter from Secretary to Government of Bengal, dated 27th March 1838, to Military Board, in reply to their Letter of the 9th instant directs, that measures may be adopted for enforcing the payment of the Rent for that portion of the Land on the sides of the Circular Canal, which has been encroached upon by Muddunmohun Ghose, and requests that an arrange-

ment may be suggested for relieving the Superintendent of Canals, Captain Thomson, from his present charge. . . .

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| <p>No. 503. Letter from Military Board, dated 6th April 1838, to Deputy Governor of Bengal, with reference to the Officiating Secretary Mr. Halliday's Letter of 27th ultimo, recommending that Lieutenant Fagan be directed to assume temporary charge of the Canals and the Toll Collections, and that the salary of the Superintendent be reduced to the former rate of Rupees 600 per mensem. . . .</p> | <p>Military Board's
Proceedings, 25th
September 1838,
No.</p> |
| <p>No. 504. Letter from Officiating Secretary to Government, dated 17th April 1838, to the Military Board, sanctioning the arrangements proposed in their Letter of the 6th instant. . . .</p> | <p>Ditto ditto, No. 79.</p> |
| <p>No. 505. Letter from Officiating Secretary to Government of Bengal, dated 24th April 1838, to Secretary to Military Board, requesting the Board to refrain for the present, from acting on his, the Officiating Secretary's, Letter of the 17th instant. . .</p> | <p>Ditto ditto, No. 80.</p> |
| <p>No. 506. Letter from Superintending Engineer, dated 29th November 1837, to Secretary to Military Board, in reply to his Letter No. 3740, of the 21st November 1837, transmits the Paper marked No. 506. a. . . .</p> | <p>Ditto 23rd October
1838, No. 36.</p> |
| <p>No. 506. a. Letter from Superintendent of Canals, dated 28th November 1837, to Superintending Engineer, L. P., stating, that as the Military Board have acceded to his proposition of damming up the Kamapokurya Khal, a measure which in a great degree defines and limits the quantity of Dredging in Tolly's Nullah, he can now undertake the proposed Dredging operations with every reasonable prospect of success; but which he could not otherwise have calculated on, had the mouth of the Khal been allowed to have remained open. . . .</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 507. Letter from Superintendent of Canals, dated 9th October 1838, to Secretary to Military Board, in reply to his Letter No. 2903, of 5th October 1838, reports on the question, whether the Collection of Tolls cannot be carried on without the intervention of any unpaid and irresponsible individual. . . .</p> | <p>Ditto ditto, No. 35.</p> |
| <p>No. 508. Letter from Military Board, dated 23rd October 1838, to Deputy Governor of Bengal, with reference to Mr. Secretary Halliday's Letter of the 18th September last, transmit the Paper marked No. 507, for his Honor's consideration and orders. . .</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 509. Letter from Superintending Engineer, S. W. P., dated 25th October 1838, to the Secretary to Military Board, stating, that the Superintendent of Canals, reports in his Letter of the 13th in-</p> | <p>Ditto 2nd Novem-
ber 1838, No. 33.</p> |

stant, that the Lock Gates having been open since the rains on the 12th instant, it was found that 1,10,000 cubic feet of mud had been deposited in the Canal by the Narcoldangah Drain. . .

Military Board's
Proceedings, 13th
November 1838,
No. 31.

No. 510. Letter from Superintending Engineer, S. W. P., dated 22nd October 1838, to the Secretary to the Military Board, transmitting the Papers marked No. 510. *a.* and 510. *b.* and stating, that the Balliaghatta Docks are capable of holding from 160 to 400 Boats ; that the Docks have been in regular use for more than 2 months, but that they have never been occupied to their full extent.

Ditto ditto, ditto

No. 510. *a.* Letter from Superintendent of Canals, dated 22nd August 1838, to the Superintending Engineer, S. W. P., transmitting a Bill for excavating the Docks at Chingreeghatta on the Salt Water Lakes, and two Plans, shewing the dimensions where the Docks differed from the original design.

Ditto ditto, No.

No. 510. *b.* Letter from Superintendent of Canals, dated 5th September 1838, to Superintending Engineer, S. W. P., transmitting a section through the Balliaghatta Docks, and stating, that the length of Bank at which Boats can make fast in the Docks is 8,000 feet, which at 50 feet per Boat, the average space they occupy when lying in their customary manner, is convenient Room for 160 Boats, and in case of necessity, 400 Boats can be accommodated, as there will be no current.

Ditto ditto, No. 34.

No. 511. Letter from Military Board, dated 13th November 1838, to the Deputy Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 510. *a.*, and recommending that it be passed, and stating, that the sum sanctioned by Government for constructing the Docks at Chingreeghatta was limited to Rs. 10,000, and subsequently Rs. 2,500 was granted for the purchase of the ground, making a Total of Rs. 12,500 ; that the Bill referred to above is Rs. 3,072, in excess of the sum sanctioned. . .

Ditto 27th November 1838, No. 38.

No. 512 Letter from Superintending Engineer, S. W. P., dated 13th November 1838, to Secretary to Military Board, transmitting with observations, the Papers marked No. 512. *a.* to No. 512. *c.* inclusive.

Ditto ditto, ditto.

No. 512. *a.* Letter from Superintendent of Canals, dated 28th August 1838, to the Superintending Engineer, S. W. P., stating, that since the excavation of the Balliaghatta Docks has been commenced, he has received numerous offers to Rent the intervening Ground ; but as they were made with the apparent intention of monopolizing the advantages of the Docks, he has hitherto declined receiving these offers ; but a Petition signed by a number of respectable people having been addressed to

him to be permitted to build Golahs in the Docks, he considers it is now time to determine how their application may be acceded to.

No. 512. *b.* Letter from Superintending Engineer, S. E. P., dated 26th October 1838, to Superintendent of Canals, in reply to his Letter of the 25th instant, states, that he is disposed to concur in the expediency of encouraging the erection of Golahs at the Balliaghatta Docks, but thinks that it will be better to send up to the Military Board some distinct proposition relative to the same, with his opinion regarding the effect of acceding to such proposition ; on the value of the Docks themselves ; on the advantage to accrue to the individual building Golahs ; and on the inconvenience or otherwise to the Public at large, that would ensue from transferring to few, the use of Ground which is now common to all.

Military Board's
Proceedings, 27th
November 1838,
No. 38.

No. 512. *c.* Letter from Superintendent of Canals, dated 3rd November 1838, to the Superintending Engineer, S. E. P., in reply to his Letter of the 26th ultimo, states, that the renting of the Ground in the Docks will be a proceeding beneficial to the Navigation of the Canal, and that the Fiscal arrangements will be made by the Government ; that if the Military Board are of opinion that no Rent is to be levied for storing Goods in the Docks, then the existing Regulation for the Canal is sufficient for the preservation of the Banks and Roads.

Ditto ditto, ditto.

No. 513. Letter from Secretary to Military Board, dated 27th November 1838, to Superintending Engineer, S. E. P., in reply to his Letter of the 13th instant, states, that the Board concur in the views taken by him relative to the disposal of the Ground in the Balliaghattah Docks, and requests him to communicate his suggestions to the Superintendent of Canals.

Ditto ditto, No.

No. 514. Letter from Superintendent of Canals, dated 19th November 1838, to the Secretary to the Military Board, transmitting the Papers marked No. 514. *a.* to No. 514. *f.* inclusive, and reporting the cause of the results of the Toll Collections being unfavourable under Act No. XXII, of 1836.

Ditto 18th December 1838, No. 35.


No. 514. *a.* Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October 1838.

Ditto ditto, ditto.

No. 514. *b.* Explanation of the Receipt and Expenditure in the Toll Collection Account for the half year, ending 31st October 1838.

Ditto ditto, ditto.

No. 514. *c.* Amount of Current Expense Bills in Toll Collection Account for the half year, ending 31st October 1838.

Ditto ditto, ditto. 

Military Board's Proceedings, 18th December 1838, No. 35.	No. 514. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year commencing 1st May 1837-38.
Ditto ditto, ditto.	No. 414. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries, made at the different Toll Houses in the half year as above...
Ditto ditto, ditto.	No. 514. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for four Months, ending the 31st October 1837-38.
Ditto ditto, ditto.	No. 515. Letter from Military Board, dated 18th December 1838, to the Deputy Governor of Bengal, transmitting the Papers marked No. 514. <i>a.</i> to No. 514. <i>f.</i> inclusive.
Ditto, 3rd January 1839, No. 41.	No. 516. Letter from Superintendent of Canals, dated 31st December 1838, to Secretary to Military Board, reporting, that he has suspended the Police Jamadar of Tolley's Nullah on account of Mal-practices; and that he fears he shall be obliged to re- move the Jamadar at Balliaghatta on the same account; and that he apprehends that it is almost impossible to carry on the Conservative duties of the Canals satisfactorily with the present establishment of 11 Burkendazes and 2 Jamadars, who have to look after eighteen miles of Navigation; that should the Board think that the late great increase of Canal Revenue warrant their recommending to Government any increase in the Conservative Establishment, he will endeavour to ascertain what number of persons would be required to conduct those duties efficiently.
Ditto ditto, No. 42	No. 517. Letter from Secretary to Military Board, dated 3rd January 1838, to Superintendent of Canals, in reply to his Letter of the 30th ultimo, approves of his removing the Officers of the Toll Department referred to in his Letter, and requests him to report what establishment he considers necessary to enable him to conduct satisfactorily the duties of the Toll Collection, mentioning at the same time the amount of increase of Tolls since he took charge, and the difference between the proposed, present, and former costs of establishment.
Ditto, 8th January 1839, No. 4.	No. 518. Letter from Secretary to Government of Bengal, dated 26th December 1838, to the Military Board, in reply to their Letter of the 16th ultimo, sanctions the expense for the execution of certain works referred to in the Superintendent of Canal's last Annual Report on the Circular and Balliaghatta Canals and Tolley's Nullah.
Ditto ditto, ditto.	No. 519. Letter from Secretary to Military Board, dated 8th January 1839, to Superintending Engineer, S. E. P., acquainting him

with the contents of the Paper marked No. 518, and requesting him to communicate the same to the Superintendent of Canals.

- No. 520. Letter from Superintendent of Canals, dated the 17th December 1838, to Superintending Engineer, S. E. P., in reply to his Letter of the 14th instant, states, that the Entally Canal Road requires large repairs annually at the close of the Rains, in consequence of the great traffic that passes over it, and from the slipping of the bank; and states, that he has no authority to expend money on a contingent work; that the delay of a week for reference and authority would be most injurious on the first appearance of the Bank of the Canal slipping; 150 or 200 Rupees expended immediately, would prevent both the Roads and Canal being made impassable for the season, and the expenditure of 1 or 2,000 Rupees for the repairs.
- Military Board's
Proceedings, 11th
January 1839, No.
40.
- No. 521. Letter from Secretary to Military Board, dated 8th January 1839, to Superintendent of Canals, requesting him to take immediate measures for the removal of two Sunken Boats which the Board are informed are lying in the Lake Channel, and directing his attention to the prevention of such obstacles to safe Navigation.
- Ditto 15th January
1839, No.
- No. 522. Letter from Superintending Engineer, S. E. P., dated 11th January 1839, to Secretary to Military Board, transmitting the Paper marked No. 522. a.
- Ditto ditto, No. 10.
- No. 522. a. Letter from Superintendent of Canals, dated 10th January 1839, to Superintending Engineer, S. E. P., stating, with reference to a Letter received from the Military Board, dated the 10th instant, that it is his custom to remove all Sunken Boats immediately, if it is in his power to do so; and that he has no means of carrying into effect the order of the Board, for the removal of obstructions from the Soonderbun Canals, and assigns his reasons for the same.
- Ditto ditto, No.
10½.
- No. 523. Letter from Secretary to Military Board, dated 15th January 1839, to Superintending Engineer, S. E. P., requesting him to instruct the Superintendent of Canals, to remove the Sunken Boats noticed above, without delay; and remarking on the Superintendent of Canal's Letter of the 10th instant.
- Ditto ditto, No. 11.
- No. 524. Letter from Superintending Engineer, S. E. P., dated 11th January 1839, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, for the construction of a Dam across the mouth of Kowrahpookeriah [Kamrapookeriah ?] Khaul, amounting to Rupees 1,946 : 14 : 1, being Rupees 833 less than the Estimate.
- Ditto, 22nd January
1839, No.

- Military Board's
Proceedings, 22nd
January 1839 No.
12.
- No. 525. Letter from Superintendent of Canals, dated 15th January 1839, to Secretary to Military Board, transmitting the Paper marked No. 525, *a.* and stating, that it clearly explains, without the usual exaggeration, a grievance of a serious nature under which a large proportion of those trading at the Balliaghatta and Circular Canals now labour, and have suffered for many years; that he has frequently brought to the notice of the Board the illegal and oppressive conduct of Collinauth Roy, his relations and dependants; that he, the Superintendent, has repeatedly complained against the above individuals to the Magistrate of the 24-Pergunnahs, but has received no redress.
- Ditto ditto, No. 13. No. 525. *a.* Petition of Sonatun Bonerjee, to the Superintendent of Canals, complaining of the oppressive and illegal practices of one Collinath Moonshee, of Tawkey in 24-Pergunnahs, in respect to forcing Boats trading to the Balliaghatta Canal to deposit their goods at his *Aurul*, and taking a Commission on the sale of the Goods.
- Ditto ditto, ditto. No. 526. Letter from Secretary to Military Board, dated 22nd January 1839, to Superintendent of Canals, in reply to his Letter of the 15th instant, requests him to obtain copies of the Proceedings which have been held in the cases to which he refers, in the Court of the Magistrate of the 24-Pergunnahs, when the Board would possibly be justified in submitting the case to Government.
- Ditto, 22nd February 1839, No. 48. No. 527. Letter from Superintendent of Canals, dated 31st January 1839, to Secretary to Military Board, transmitting copy of the Lease granted by him to persons applying for Ground in the Balliaghatta Docks.
- Ditto ditto, ditto. No. 528. Letter from Secretary to Military Board, dated 22nd February 1839, to Captain Thomson, Superintendent of Canals, in reply to his Letter of the 31st ultimo, transmits certain Papers, and requests him, in communication with Lieutenant Boileau, to take them into consideration, and furnish the Board with further information relative to the conditions under which it is proposed to let the Balliaghatta Docks.
- Ditto 26th April 1839, No. No. 529. Letter from Superintending Engineer, dated 10th April 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, Lieutenant Boileau, for clearing and digging out the Dhurumtollah Cess Pool, amounting to Rs. 484: 3: 0.
- Ditto, 10th May 1839, No. 33. No. 530. Letter from Superintendent of Canals, dated 3rd May 1839, to Secretary to Military Board, reporting, that he has succeeded in proving the gross cases of Fraud on the part of the Toll-

keeper stationed at Dhaphah and Chitpore, and the connivance of the Jamadar stationed at Balliaghattah, and recommending that they be dismissed from their situations.

- No. 531. Letter from Secretary to Military Board, dated 10th May 1839, to Superintendent of Canals, stating, that the Board, considering him competent to pass a decision in such cases as are referred to in his Letter, do not think it necessary to interfere with his dismissing the Officers of the Toll Department mentioned by him.
- Military Board's
Proceedings, 10th
May 1839, No. 33.
- No. 532. Letter from Superintendent of Canals, dated 18th May 1839, to Secretary to Military Board, requesting instructions on the propriety of levying Tolls on Boats entering the Balliaghattah Docks and the Channel leading to Kaleenath Roy's Bazar, and stating his reason for not having hitherto levied such Toll. . .
- Ditto, 31st May
1839, No. 51.
- No. 533. Letter from Secretary to Military Board, dated 31st May 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, states, that Toll should be taken from all Boats that enter the Channel leading to Collynath's Bazar—but not from those entering the Docks; and requests him to remove the Dhaphah Toll Station from its present position, to the East of Collynath Roy's Channel and of the Docks, by which means he, the Superintendent, would be enabled to levy Toll from all. . .
- Ditto ditto, ditto.
- No. 533½. Petition from the Canal Informers, to the Military Board, dated bringing to the notice of the Board certain abuses in the Calcutta Canals.
- Ditto, 4th June
1839, No. 77.
- No. 534. Letter from Secretary to Military Board, dated 9th April 1839, to Superintendent of Canals, transmitting the Paper marked No. 533½.
- Ditto ditto, ditto.
- No. 535. Letter from Superintendent of Canals, dated 12th April 1839, to Secretary to Military Board, in reply to his Letter of the 9th instant, requests to be furnished with Copies of the former Petitions of the parties referred to in the Paper marked No. 533½.
- Ditto ditto, No. 78.
- No. 536. Petition from Canal Goyendah, or Informer, dated received 16th April 1839, to the Military Board, reporting various Malpractices in the Calcutta Canals.
- Ditto ditto, No. 79.
- No. 537. Letter from Secretary to Military Board, dated 16th April 1839, to the Superintendent of Canals, in reply to his Letter of the 12th instant, transmits 3 Petitions, and states, that all former Petitions to the Board regarding the abuses on the Canals have been generally referred to the Superintendent, in whose Records they should be found.
- Ditto ditto, ditto.

Military Board's Proceedings, 4th June 1839, No. 80.	No. 538. Letter from Superintendent of Canals, dated 23rd April 1839, to Secretary to Military Board, returning the Papers marked No. 536, and promising to furnish a Report relative to the Mal-practices on the Calcutta Canals.
Ditto ditto, No. 81.	No. 539. Letter from Superintendent of Canals, dated 25th April 1839, to Secretary to the Military Board, transmitting the Paper marked No. 539, <i>a.</i> to No. 539, <i>d.</i> inclusive.
Ditto ditto, No. 82.	No. 539. <i>a.</i> Notes by the Superintendent of Canals on the Petition of Cossynath Nundee, to the Military Board, dated the 4th July 1838.
	No. 539. <i>b.</i> The like on the Petition of Sonatun Banoorjea, to Superintendent of Canals, dated January 1839.
	No. 539. <i>c.</i> Ditto on the Correspondence in the Sungbad Sowdamini, Calcutta Newspaper, dated 20th March 1839.
	No. 539. <i>d.</i> Ditto on the Petition of Gobind Goyendah, &c. to the Military Board, dated 9th April 1839.
Ditto ditto, ditto.	No. 540. Letter from Secretary to Military Board, dated 4th June 1839, to Superintendent of Canals, in reply to his Letter of the 25th April last, states, that the Board approve of his proceedings, and request he will continue to prevent peculation and abuse.
Ditto, 11th June 1839, No. 52.	No. 541. Letter from Superintendent of Canals, dated 10th June 1839, to Secretary to Military Board, reporting on the steps he has taken for preventing or detecting any Fraud in the Toll Collections, and the realization of his expectation of the increase of Collections since the appointment of the two new Darogahs.
Ditto ditto, ditto.	No. 542. Letter from the Secretary to Military Board, dated 11th June 1839, to Superintendent of Canals, approving of the measures adopted by him for the prevention of peculation and abuse on the Calcutta Canals.
Ditto, 18th June 1839, No. 20.	No. 542½. Letter from Secretary to Government of Bengal, dated 4th June 1839, to Military Board, with reference to Board's Letter of the 23rd October 1839, transmits the Paper marked No. 542½, <i>a.</i>
Ditto ditto, No. 21.	No. 542½. <i>a.</i> Letter from Accountant General, dated 8th May 1839, to Secretary to Government of Bengal, in reply to his Letter of the 29th January last, states, that (he) the Accountant General, concurs with the Military Board in respect to doing away with all unpaid and irresponsible agency in the realization of the Calcutta Toll, and points out the mode in which the Toll Collections should be made over to the General Treasury.

- No. 543. Letter from Superintendent of Canals, dated 31st May last, to the Secretary to Military Board, bringing to notice the very great loss sustained in the Toll Collection by the Rule of Measurement for Boats laid down in General Orders of 1st November 1836, which direct the rejecting the fractions of a foot for making the measurement; and stating, that the expense would be trifling of having a set of Tables calculated for general use, in which the Tonnage of any Boat might be ascertained by simple inspection when its dimensions were given.
- No. 544. Letter from Secretary to Military Board, dated the 4th June 1839, to Superintendent of Canals, in reply to his Letter of the 31st ultimo, states, that unless the correct measurement of Boats is likely to make a material difference in the amount of Tolls, the Board would not wish to agitate the matter, as any alteration in the practice now prevailing, would require a revision of Act No. XXII. of 1836.
- No. 545. Letter from Superintendent of Canals, dated 13th June 1839, to Secretary to Military Board, in reply to his Letter of the 4th instant, transmits the Papers marked No. 545, *a.* and No. 545, *b.* exhibiting a loss in the Toll Collection of a quarter of the proper Toll by the present manner of measuring Boats.
- No. 545. *a.* Detail Statement of the measurement of Boats at Kidderpore Chokey, entering on the 10th of January 1839, according to the present Regulation, rejecting inches.
- No. 545. *b.* The like according to the proposed Regulation, not rejecting inches.
- No. 545½. Letter from Secretary to Military Board, dated 18th June 1839, to Superintendent of Canals, transmitting copies of the Papers marked No. 542½, and No. 542½, *a.* for any remarks he may wish to offer, and requesting to know what arrangements he has effected for the deposit of the Toll Collection.
- No. 546. Letter from Superintendent of Canals, dated 1st July 1839, to Secretary to Military Board, bringing to notice another species of Fraud which he had just discovered in the Toll Department.
- No. 546½. Letter from Military Board, dated 23rd July 1839, to the Deputy Governor of Bengal, transmitting a revised Estimate, amounting to Rupees 1,220:15:0, by the Superintendent of Canals, for repairing the Puckah Road on the West Bank of the Circular Canal.
- No. 547. Letter from Superintending Engineer, S. E. P., dated 5th December 1838, to Secretary to Military Board, transmitting the

Ditto ditto, No. 60.

Ditto ditto, No. 61.

Ditto ditto, No. 62.

Ditto ditto, No. 63.

Ditto ditto, No. 22.

Ditto ditto, No. 64.

Ditto, 23rd July
1839, No. 64.Ditto, 2nd August
1839, No. 33.

Papers marked No. 547, *a.* to No. 547, *d.* inclusive, relative to increasing the width of the Road on the South side of the Balliaghatta Canal to 20 feet, and of restoring the Slope of the Bank on the same side, and stating, that of the two propositions adverted to by the Superintendent of Canals, that of raising the Road and Sloping the Bank, appearing liable to many objections, and involving the necessity of ultimately purchasing Land, is the only measure which requires consideration.

Military Board's
Proceedings, 2nd
August 1839, No.
34.

No. 547. *a.* Letter from Superintending Engineer, S. E. P., dated 22nd October 1838, to Superintendent of Canals, transmitting a Copy of (his) the Superintending Engineer's Letter to the Secretary to the Military Board of this day's date, and requesting him, the Superintendent, to act upon the 5th and 10th Paragraphs of the above Letter.

Ditto ditto, ditto.

No. 547. *b.* Letter from Superintendent of Canals, dated 3rd November 1838, to Superintending Engineer, S. E. P., in reply to his Letter marked No. 547, *a.* represents the circumstances which prevent his framing an Estimate of the expense of Sloping the South Bank of the Balliaghatta Canal, and of purchasing sufficient Ground to make the Road 20 feet wide.

Ditto ditto, No. 33
and 34.

No. 547. *c.* Letter from Superintending Engineer, S. E. P., dated 20th November 1838, to Superintendent of Canals, with reference to (his) the Superintending Engineer's Letter of the 22nd ultimo, transmits Copy of a Letter from the Assistant Secretary to the Military Board, dated the 16th instant, to (his) the Superintending Engineer's address, and requests, that (he) the Superintendent will act as pointed out by the Military Board, and hopes that he will be able to furnish, for submission to the Board, a scheme, calculated to secure the permanence of the Canal Bank.

Ditto ditto, ditto.

No. 547. *d.* Letter from Superintendent of Canals, dated 1st December 1838, to Superintending Engineer, S. E. P., stating, that previously to replying in detail to the several subjects brought forward in his Letter of the 20th ultimo, he begs to state the circumstances connected with the same, which occurred some years ago. . .

Ditto ditto, No.

No. 548. Letter from Secretary to Military Board, dated 19th February 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 5th December 1838, marked No. 547, requests him to direct Lieutenant Boileau to examine and report upon the subject of (his) the Superintending Engineer's above Letter . .

Ditto ditto, No. 37.

No. 549. Letter from Superintending Engineer, S. E. P., dated the 27th June 1839, to the Secretary to the Military Board, transmitting, with observations, the Paper marked No. 549, *a.*

No. 549. *a.* Letter from Superintendent of Canals, Lieutenant A. H. E. Boileau, dated 2nd May 1839, to Superintending Engineer, S. E. P., reporting on the widening of the Road on the South Bank of the Balliaghatta Canal, and the Sloping of the South Bank of the Canal.

Ditto ditto, No.

No. 550. Letter from Secretary to Military Board, dated 2nd August 1839, to the Superintending Engineer, S. E. P., in reply to his Letter of the 27th June last, requests him to direct the Superintendent of Canals to furnish an Estimate for strengthening the South Bank of the Balliaghatta Canal.

Ditto ditto, No. 14.

No. 550½. Letter from Military Board, dated 2nd August 1839, to the Deputy Governor of Bengal, reporting, that no progress has been made in the construction of the Iron Dredging Boat for the Calcutta Canals by the Controller of the Government Steam Vessels, and transmitting correspondence connected therewith, together with Plan and specification for making an Iron Hull to the East Indian Dredging Machinery, and recommending that the Controller should receive positive orders from Government to complete the work without delay, or that the Iron Hull be obtained from England.

Ditto, 13th August
1839, No. 45.

No. 551. Letter from Superintendent of Canals, dated 7th August 1839, to Superintending Engineer, S. E. P., reporting the Sliding of 255 feet in length of the Bank of the Entallee Canal, midway between the Dhurrumtollah Cess Pool and Cooliah Bridge ; and about 60 feet in length of the Bank of the Circular Canal immediately to the Eastward of the Lock at Chitpore, caused by the last heavy rains, and owing to a portion of the Bank having been carried across the site of an old Tank ; and stating, that he has taken measures for remedying the above evil.

Ditto, 16th August
1839, No. 58.

No. 552. Letter from Superintendent of Canals, dated 20th May 1839, to Secretary to Military Board, transmitting the Papers marked No. 552, *a.* to No. 552, *f.* inclusive, and reporting on the Toll Collection during the half year, ending 30th April 1839.

Ditto ditto, No. 59,

No. 552. *a.* Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1838 to 30th April 1839.

Ditto ditto, ditto.

No. 552. *b.* Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1839.

Ditto ditto, ditto.

No. 552. *c.* Amount of Current Expense Bills in Toll Collection Account for the half year, ending 30th April 1839.

Ditto ditto, ditto.

No. 552. *d.* Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year, ending 30th April 1839.

Military Board's Proceedings, 16th August 1839, No. 59.	No. 552. <i>e.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, ending 30th April 1839.
Ditto ditto, ditto.	No. 552. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending the 30th April 1839.
Ditto ditto, No.	No. 553. Letter from Military Board, dated 16th August 1839, to the Deputy Governor of Bengal, transmitting the Papers marked No. 552, <i>a.</i> to No. 552, <i>f.</i> inclusive, and also the Papers stated in the margin,* and submitting their sentiments on the manner of depositing the Toll Collections in the Public Treasury, and recommending the revision in the Toll Establishment, as well as an alteration in the present mode of measuring Boats, and suggesting certain modifications in Act No. XXII, of 1836, and recommending strongly the farming out the Toll.
* Capt. Boileau's Letter, No. 49, of 31st May 1839.	
Secretary Military Board's Letter, No. 806, of 4th June 1839.	
Captain Boileau's Letter, No. 66, dated 13th June 1839.	
Secretary Military Board's Letter, No. 1313, dated 2d July 1839.	
Military Board's Proceedings, 16th August 1839, No. 60.	No. 554. Letter from Superintendent of Canals, dated 25th June 1839, to Secretary to Military Board, in reply to his Letter of the 18th instant, states the arrangement he has effected for the deposit of the Toll Collection in the Public Treasury; and proposes fixed Salaries to the Toll Darogahs
Ditto ditto, No. 61.	No. 555. Letter from Secretary to Military Board, dated 16th July 1839, to Superintendent of Canals, approving of the arrangement referred to in his Letter of the 25th ultimo, and requesting him to state, what Net Salary should be received by the Darogah when relieved from the maintenance of the Collecting Establishment.
Ditto ditto, No. 62.	No. 556. Letter from Superintendent of Canals, dated 18th July 1839, to the Secretary to the Military Board, in reply to his Letter of the 16th instant, submits with observations a Memo. of the establishment required at each Station, for Collecting Toll. ..
Ditto, 3rd September 1839, No. 11.	No. 557. Letter from Superintendent of Canals, dated 3rd September 1839, to Secretary to Military Board, recommending the immediate removal of the Toll Collector of Pauspotta, as he has been detected of embezzling the Public Money.
Ditto ditto, ditto.	No. 558. Letter from Secretary to Military Board, dated 3rd September 1839, to the Superintendent of Canals, authorizing the removal of the Toll Collector of Pauspotta.
Ditto, 6th September 1839, No. 43.	No. 559. Letter from Superintendent of Canals, dated 4th September 1839, to Secretary to Military Board, recommending certain arrangements in consequence of the dismissal of the Toll Darogah at Pauspotta.

No. 560. Letter from Superintending Engineer, S. E. P., dated the 27th August 1839, to the Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 409 : 15 : 10, for partially Digging out Sand Banks in Tolley's Nullah.	
No. 561. Letter from Superintending Engineer, S. E. P., dated 27th August 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 497, for repairing the Soonderbun Tow-paths during the season of 1838-39.	Ditto ditto, No. 47
No. 562. Letter from Superintending Engineer, S. E. P., dated 21st August 1839, to Secretary to Military Board, in reply to his Letter of the 22nd February last, transmits the Papers marked No. 562, a. and No. 562, a. ⁽¹⁾ to No. 562, b. ⁽⁶⁾ inclusive, relative to the disposable Grounds at the Balliaghatta Docks. ..	Ditto ditto, No. 49.
No. 562. a. Letter from Superintendent of Canals, dated 2nd March 1839, to Superintending Engineer, S. E. P., stating, that he has endeavoured to obtain farther information respecting the disposable Grounds at the Balliaghatta Docks, the result of which he will communicate hereafter ; and reports, that there appears to be no records whatever of the number of Boats that have entered the Docks since they have been thrown open to the Public ; nor the quantity of Goods that have generally been housed in such temporary Storehouses as have been erected on the lots of Ground already leased out, and that he has made arrangements to remedy the above.	Ditto ditto, No. 50.
No. 562. b. Letter from Superintendent of Canals, dated 16th July 1839, to the Superintending Engineer, S. E. P., transmitting the Paper marked No. 562, b. ⁽¹⁾ to No. 562, b. ⁽⁶⁾ inclusive, and stating, that the whole of the 36 lots within the Docks are now let, but that he thinks that no Ground Rent ought yet to be demanded from the Lease-holders.	Ditto ditto, No. 51.
No. 562. b. ⁽¹⁾ Statement of the daily entrance and exit of Boats into and from the Balliaghatta Dock, for the month of March 1839. ..	Ditto ditto, No. 52.
No. 562. b. ⁽²⁾ The like for April 1839.	Ditto ditto, ditto.
No. 562. b. ⁽³⁾ The like for May 1839.	Ditto ditto, ditto.
No. 562. b. ⁽⁴⁾ The like for June 1839.	Ditto ditto, ditto.
No. 562. b. ⁽⁵⁾ Statement of the lots on which Storehouses have been erected at the Balliaghatta Dock, for the month of March 1839.	Ditto ditto, No. 53.

Military Board's Proceedings, 13th September 1839, No. 53.	No. 562. <i>b.</i> (6) The like for the month of April 1839.
Ditto ditto, No. 54.	No. 563. Letter from Superintending Engineer, S. E. P., dated 21st August 1839, to Secretary to Military Board, transmitting the Estimate marked No. 563, <i>a.</i> and with reference to (his) the Superintending Engineer's Letter of the 22nd ultimo, submits for the consideration of the Board, the result of his observations on certain works at Balliaghatta Docks, proposed in the above Estimate.
Ditto ditto, ditto.	No. 563. <i>a.</i> Estimate, amounting to Rupees 712 : 4 : 9, of the probable expense of levelling the Roads and constructing brick on Edge Drains at the Balliaghatta Docks, dated the 17th December 1838, by Captain Thomson, Superintendent of Canals. . .
Ditto ditto, No.	No. 564. Letter from Secretary to Military Board, dated 13th September 1839, to the Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals to submit Plan and Estimate of the Tunnel Drain, recommended in the 5th Paragraph of the Superintending Engineer's Letter now under reply, and with reference to his communication of the 21st ultimo, states that the matter therein referred to, will be held over for the present.
Ditto, 20th Sep- tember 1839, No.	No. 565. Letter from Superintending Engineer, S. E. P., dated 22nd August 1839, to Secretary to Military Board, in reply to his Letter of the 2nd instant, submits an Estimate by the Superintendent of Canals, amounting to Rupees 1,611 : 4 : 0, for strengthening the South Bank of the Balliaghatta Canal by rough piling.
Ditto ditto, No. 40.	No. 566. Letter from Superintending Engineer, S. E. P., dated 27th August 1839, to Secretary to Military Board, submitting an Estimate by the Superintendent of Canals, amounting to Rupees 8,507 : 13 : 0, for constructing a Pucka Road on the South Bank of the Balliaghatta Canal.
Ditto ditto, No.	No. 567. Letter from Military Board, dated 20th September 1839, to the Deputy Governor of Bengal, with reference to the 3rd and 4th Paragraphs of their Report of the 16th November, and to the 2nd Paragraph of Mr. Secretary Halliday's Letter of the 26th December last, transmit the Estimates referred to in the Papers marked No. 565, and No. 566, and state, that they consider the works noticed in the Estimates highly useful and necessary...
Ditto ditto, No. 15.	No. 568. Letter from Superintendent of Canals, dated 18th September 1839, to Secretary to Military Board, with reference to the Collection of Tolls having during the past year decreased from Rupees 1,71,000 to 71,000, solicits the attention of the Board

to that part of his predecessor's Report, dated the 19th November 1838, which relates to the amount of traffic carried on in Canoes or Boats of less than 25 maunds burden ; and states, that many of these Boats are between twenty-five and fifty maunds burden, and that the Revenue is seriously affected by their not being subject to Toll.

No. 569. Letter from Secretary to Military Board, dated 20th September 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, states, that the Board approves of all his arrangements.

Military Board's
Proceedings, 20th
September 1839,
No. 40.

No. 570. Letter from Secretary to Government of Bengal, dated 19th September 1839, to Military Board, transmitting Copy of a Letter this day addressed to Captain W. R. Fitzgerald, appointing him to Officiate as Superintendent of Canals, &c. during the absence of Captain Boileau.

Ditto, 24th September
1839, No. 9.

No. 571. Letter from Superintendent of Canals, dated 23rd September 1839, to Secretary to Military Board, transmitting the Papers marked No. 571, *a.* and No. 571, *b.*

Ditto, 27th September
1839, No. 15.

No. 571. *a.* Letter from Secretary to Sudder Board of Revenue, dated 11th September 1839, to the Superintendent of Canals, requesting him to report direct to the Sudder Board, on the system of management and check which prevails in the Collection of Tolls under his Superintendence, and to submit a Statement of the Collections for the year 1838-39.

Ditto ditto, ditto.

No. 571. *b.* Letter from Superintendent of Canals, dated 21st September 1839, to Secretary to Sudder Board of Revenue, furnishing the information requested in the Paper marked No. 571, *a.* in respect to detailing the system of management and check, and describing the Northern and Southern lines of Navigation on which Tolls are collected, including the Circular Canal &c., stating the number of Boats passing, and amount of Toll realized during the year 1838-39 ; and explaining the great decrease in the Collection ; the difficulty in preventing embezzlement by the Native Toll Establishment ; the efficacy of the means adopted for increasing the Revenue ; the reformation effected by discharging all the Old Amlahs ; the seizing of Boats without Tickets, &c. ; the detailing the present establishment for collecting the Tolls, with remarks on the conservation of the Police Establishment, and explanation of the Toll Tickets issued to Boats ; the method of detecting attempts to falsify Tickets ; the system of making payments into the Treasury ; and the requisites for the prevention of Fraud ; the propriety of investigating all complaints ; the reasons against farming the

Ditto ditto, ditto.

Tolls ; and the additional trouble it would give to the Superintendent of Canals.

Military Board's
Proceedings, 27th
September 1839,
No. 16.

No. 572. Letter from Secretary to Military Board, dated 27th September 1839, to the Superintendent of Canals, in reply to his Letter of the 23rd instant, states, that a reference having been made to the Sudder Board of Revenue, on the subject of their Secretary's Letter to the address of the Superintendent of Canals, it has been ascertained, that, that Letter or application was entirely an oversight ; but the Military Board approve of (his) the Superintendent of Canals having complied in the present instance with the request of the Sudder Board, but they request in future that he will confine his communications on similar subjects as much as possible to the Office of the Military Board.

Ditto ditto, No. 18. No. 573. Letter from Superintending Engineer, S. E. P., dated 25th September 1839, to Secretary to Military Board, transmitting the Paper marked No. 573, a. and stating with reference to the 3rd Paragraph of the same, that he will, with the Board's approval, request the Superintendent of Canals to furnish an Estimate of the probable expense of reconstructing the Pauspotta Toll House with kutcha and pukka walls, and with as much of the old materials as may be available.

Ditto ditto, No. 19. No. 573. a. Letter from Superintendent of Canals, dated 23rd September 1839, to the Superintending Engineer, S. E. P., reporting, that the Toll House at Pauspotta has been blown down by the late storm, and that some immediate accommodation is required for the Toll Establishment, for which purpose he recommends a second-hand Tent be purchased or large Boat hired, and that the Toll House be rebuilt at a cost of about 500, or 600 Rupees, with kutcha and pukka Masonry, 200 yards Westward of its late position.

Ditto ditto, No. 20. No. 574. Letter from Secretary to Military Board, dated 27th September 1839, to the Superintending Engineer, S. E. P., sanctioning the Superintendent of Canals hiring a Boat for the present accommodation of the Toll Establishment, and requesting an Estimate for the reconstruction of the Pauspotta Toll House. ..

Ditto 4th October 1839, No. 26. No. 575. Letter from Superintending Engineer, S. E. P., dated 30th September 1839, to Secretary to Military Board, transmitting with observations, the Paper marked No. 575, a.

Ditto ditto, No. 27. No. 575. a. Letter from Superintendent of Canals, dated 26th September 1839, to the Superintending Engineer, S. E. P., reporting, that during the late unusually high Spring Tides, the North Bank

of Tolley's Nullah has received considerable damage in two places; viz. near to the Toll House (West End,) and at the Iron Yard Premises, and recommending that piling and ballast be used to remedy the above injury.

- No. 576. Letter from Secretary to Military Board, dated 4th October 1839, to Superintending Engineer, S. E. P., authorizing him to do whatever he may consider necessary to repair the injury done to the Banks of Tolley's Nullah, referred to in his Letter of the 30th ultimo. Military Board's Proceedings, 4th October 1839, No.
- No. 577. Letter from Superintendent of Canals, dated 30th September 1839, to the Superintending Engineer, S. E. P., stating, that the Fences of the 750 Trees on the Banks of the Circular Canal having now been standing for 3 years, the Fences of about 450 of the Trees require to be renewed at a cost of Rupees 200. Ditto, 8th October 1839, No. 50.
- No. 578. Letter from Superintendent of Canals, dated 5th October 1839, to Secretary to Military Board, reporting, that he has given over the temporary charge of his Office to Captain Fitzgerald. Ditto ditto, No.
- No. 579. Letter from Military Board, dated 8th October 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 3rd instant, transmitting the Paper marked No. 577, sanctions the expense of renewing the Fences of the Trees on the Banks of the Circular Canal. Ditto ditto, ditto.
- No. 580. Letter from Superintendent of Canals, dated 3rd September 1839, to Secretary to Military Board, transmitting, with observations, the Papers marked No. 580, *a.* and No. 580, *b.* Ditto, 11th October 1839, No. 94.
- No. 580. *a.* Table shewing the real maundage of each Boat according to the given dimensions, rejecting the surplus inches above quarters of feet. Ditto ditto, ditto.
- No. 580. *b.* Table shewing the amount of maundage according to the Act No. XXII. of 1836, all broken maundage, short of 25 maunds, being rejected in Boats of less Tonnage than 500 maunds; all broken amounts below 50 maunds being rejected in Boats of from 500 to 1,000 maunds; and all fractions below 100 maunds being omitted in the Tonnage of Boats which exceed 1,000 maunds. Ditto ditto, ditto.
- No. 581. Letter from Military Board, dated 10th September 1839, to Deputy Governor of Bengal, in continuation of the 13th and 14th Para. of their Report, dated the 16th ultimo, submit the Papers marked No. 580, and its enclosures, and recommend that 100 Copies of the Table marked No. 580. *b.*, shewing the Ditto ditto, No.

amount of Toll in Rupees and Annas, and 200 Copies of the Abstract Statement be lithographed.

Military Board's
Proceedings, 11th
October 1839, No.
104.

No. 582. Letter from Secretary to Government, dated 19th September 1839, to Military Board, in reply to Board's Letter of the 16th ultimo and 10th instant, approves of the several arrangements proposed in regard to the Calcutta Canals.

Ditto ditto, No. 11. No. 583. Letter from Military Board, dated 11th October 1839, to Superintendent of Canals, with reference to his Letters No. 72, of the 25th June and No. 98, of the 18th July last, states, that the Government has been pleased to sanction the arrangements proposed by him...

Ditto ditto, No. 39. No. 584. Letter from Superintending Engineer, S. E. P., dated 4th October 1839, to Secretary to Military Board, transmitting the Papers marked No. 584, *a.* to No. 584, *b.* inclusive, and recommending that the Road referred to in the Petition be repaired at a Cost not exceeding 200 Rupees; and with reference to the Statement of the Petitioners, that no answer has yet been given to their former Petition, refers to his predecessor's Letter No. 551, of the 22nd June 1838, and its enclosure, by which it will be seen, that the prayer of the Petitioners has been reported upon.

Ditto ditto, ditto. No. 584. *a.* Letter from Superintendent of Canals, dated 2nd October 1839, to the Superintending Engineer, S. E. P., transmitting the Papers marked No. 584, *a.*⁽¹⁾ and No. 584, *a.*⁽²⁾ and No. 584, *b.* and requesting his orders on the same... . .

Ditto ditto, ditto. No. 584. *a.*⁽¹⁾ Petition from the owners of Landed Property on the East of the Circular Canal near Mooroollee Mannicktollah, to the Superintendent of Canals, dated transmitting the Paper marked No. 584, *a.*⁽²⁾ and stating, that they would even be contented if a passage were made by the side of the Canal to carry off the rain water, which at present is a cause of great inconvenience.

Ditto ditto, ditto. No. 584. *a.*⁽²⁾ Petition from Rajah Radahkanth Deb, and others, dated the 16th April 1838, to the Deputy Governor of Bengal, relative to the repair of the Kutcha Road on the East Bank of the Circular Canal between the Dum-Dum and Mannicktollah Bridges, and the losses and inconvenience to which they have been subjected by the cutting of the Circular Canal, and by the want of a Bridge and Pucka Road.

Ditto ditto, ditto. No. 584. *b.* Letter from J. Bedford, Assistant Overseer, dated 2nd October 1839, to the Superintendent of Canals, stating, that about 200 Rupees could be well expended on the Roads and Drains referred to in the Paper marked No. 584, *a.*⁽²⁾, but that owing to

the traffic by Hackeries loaded with bricks, it cannot be expected that the Road will be in good condition during the rains. ..

- No. 585. Letter from Secretary to Military Board, dated 11th October 1839, to the Superintending Engineer, S. E. P., in reply to his Letter of the 4th instant, authorizes the expense required for the repairs of the Road referred to in his Letter at a cost not exceeding Rupees 200.
- Military Board's
Proceedings, 11th
October 1839, No.
- No. 586. Letter from Superintending Engineer, S. E. P., dated 24th September 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 282: 12: 0, for making stone copings to the entrance of the Balliaghatta Dock.
- Ditto 25th October
1839, No. 44.
- No. 587. Letter from Superintendent of Canals, dated 25th October 1839, to Secretary to Military Board, submitting for approval, the Papers marked No. 587, a.
- Ditto 15th November
1839, No. 58.
- No. 587. a. Draft of a Notification to be published, specifying the alterations to be made in the Act No. XXII. of 1836, in the Measurement of Boats, &c. passing into the Calcutta Canals.
- Ditto ditto, No. 59.
- No. 588. Letter from Superintendent of Canals, dated 15th November 1839, to Secretary to Military Board, in reply to his Letter of the 8th instant, states, that the Ground on the Banks of the Hosenabad Canal is farmed out for 5 years, viz. from 1st May 1837 to 1st May 1842, to Nobinchunder Mittre, at an Annual Rent of Rupees 160, and is regularly paid by Quarterly Instalments, and accounted to Government in the Toll Account.
- Ditto ditto, No. 36.
- No. 589. Letter from Military Board, dated 15th November 1839, to Deputy Governor of Bengal, transmitting the Paper marked No. 587, a. and requesting, that the alterations proposed may be carried into effect from the 1st January 1840.
- Ditto ditto, No.
- No. 590. Letter from Captain A. H. E. Boileau, dated 23rd November 1839, to Secretary to Military Board, reporting his return from Sea, and of his having resumed charge of the Office of the Superintendent of Canals from Captain W. R. Fitzgerald.
- Ditto, 29th November
1839, No. 8.
- No. 591. Letter from Secretary to Government of Bengal, dated 3rd December 1839, to Military Board, in reply to their Letter of the 20th September last, sanctions the Superintendent of Canal's Estimate for strengthening the South Bank of the Balliaghatta Canal by rough Piling, and requests further information respecting the construction of a Pucka Road on the South Bank of the above Canal.
- Ditto, 10th December
1839, No. 3.

Military Board's Proceedings, 10th December 1839, No.	No. 592. Letter from Secretary to Military Board, dated 10th December 1839, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals, with reference to his Estimate for a Pucka Road on the South Bank of the Balliaghatta Canal, received with (his) the Superintending Engineer's Letter of the 27th August last, to specify the extent of advantage likely to attend the construction of the Road in question.
Ditto, 17th Decem- ber 1839, No. 7.	No. 593. Letter from Superintendent of Canals, dated 7th December 1839, to Superintending Engineer, S. E. P., requesting permission to replace at a cost of 270 Rupees, 900 Luggowing Posts which are wanting on the Banks of the Balliaghatta, Entallee, and Circular Canals.
Ditto ditto, No.	No. 594. Letter from Secretary to Military Board, dated 17th December 1839, to Superintending Engineer, S. E. P., authorizing him to replace the Luggowing Posts which are wanting on the Banks of the Circular, Eastern, and Balliaghatta Canals, and request- ing him to ascertain what would be the cost of substituting Stone Posts for those of Wood.
Ditto, 20th Decem- ber 1839, No. 23.	No. 595. Letter from Superintendent of Canals, dated 18th December 1839, to Military Board, transmitting the Paper marked No. 595, <i>a.</i> and stating, that he considers that a higher sum may be obtained by publicly advertising the Lease of the Fisheries and Ferries.
Ditto ditto, ditto.	No. 595. <i>a.</i> Form of Notice to be advertised in English and Bengallee for farming Tolley's Nullah and the Circular Canal Fisheries, and the Ferry on Tolley's Nullah.
Ditto ditto, No.	No. 596. Letter from Secretary to Military Board, dated 20th December 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, authorises him to advertize the Notice pro- posed by him.
Ditto 14th January 1840, No. 26.	No. 597. Letter from Superintending Engineer, S. E. P., dated 5th Ja- nuary 1840, to Secretary to Military Board, in reply to his Letter of the 17th ultimo, transmits the Papers marked No. 597, <i>a.</i> and No. 597, <i>b.</i>
Ditto ditto, ditto.	No. 597. <i>a.</i> Letter from Superintending Engineer, S. E. P., dated 25th December 1839, to Superintendent of Canals, transmitting a copy of the Military Board's Letter of the 17th instant, and requesting to be furnished with the information noticed in the same; and referring to the Board's suggestion of substituting Stone for Wooden Posts, remarks, that possibly some unser- viceable Iron Guns in the Arsenal might be available for the

above purpose, and that it appears to him, that Stone, *i. e.* Chunar Stone, would not only be expensive in its prime cost, but prove unsuitable, from its frangibility, and liability to rapid disintegration by exposure to Salt air.

No. 597. *b.* Letter from Superintendent of Canals, dated 31st December 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 25th instant, states, that he has inquired at the Arsenal of Fort William, and finds, that there are but few short Carronades in Store as old Iron, and those are not sufficient for the supply of Kentledge to the Marine Department; that there are nearly a thousand pieces of condemned Iron Ordnance of Native manufacture, of various sizes in the Agra Magazine, which might answer, if brought to Calcutta; that the price of Stone Posts of the smallest efficient size, about 4 feet long and 3 or 4 inches square, and projecting one foot above the surface of the Ground, would be about 3 Rupees each; that they would be more durable than Wood, but that they would not compensate for their greater expense; and states, that 6 feet Wooden Posts will suffice, which will reduce the estimated expense to about one-half.

Military Board's
Proceedings, 11th
January 1840, No.
27.

No. 598. Letter from Secretary to Military Board, dated 14th January 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 5th instant, approves of the instructions given by him to the Superintendent of Canals, relative to the Wooden Posts along the Banks of the Canals.

Ditto ditto, No.

No. 599. Letter from J. A. Dorin, Esq. Accountant Revenue Department, dated 14th December 1839, to Secretary to Military Board, transmitting for the information of the Board, the Papers marked No. 599, *a.* and No. 599, *b.* also Copy of a Letter addressed by him this day to the Superintendent of Canals, marked No. 599. *c.* and with reference to the 2nd Para. of the same, requests, the Board will return to the Superintendent of Canals, after audit, all Bills submitted by him, instead of sending them to the Accountant General for adjustment, to enable the Superintendent to transmit them with his monthly Cash Account, in support of the Charges that may be exhibited therein.

Ditto 17th January
1840, No. 5.

No. 599. *a.* Extract of a Letter from the Accountant General, to the Secretary to the Government of Bengal, dated 8th May 1839, stating, that the Charges of Collection on account of Tolls ought to be in his opinion, to be shewn in the Accounts of the Collector of Tolls, separately rendered by him to the Revenue Accountant, as a set-off against the gross Toll Collections, and requesting permission to instruct the Revenue Accountant to carry the above into effect.

Ditto ditto, No.

Military Board's
Proceedings, 17th
January 1840, No.

No. 599. *b.* Extract of a Letter from Secretary to the Government of Bengal, to the Accountant General, dated 4th June 1839, approving of the suggestion contained in his Letter of the 8th May 1839.

Ditto ditto, ditto.

No. 599. *c.* Letter from J. A. Dorin, Esq. Accountant Revenue Department, dated 14th December 1839, to Superintendent of Canals, in continuation of (his) Mr. Dorin's Letters of the 16th and 26th August 1839, states, that the arrangements now sanctioned by Government, has in view the complete separation of (his) the Superintendent's accounts and vouchers, and receipts and expenditure as Superintendent of Tolls, from his accounts and vouchers, and receipts and expenditure, as Agent for Iron Suspension Bridges—the former being adjusted by the Accountant Revenue Department, and the latter by the Accountant General.

Ditto ditto, No.

No. 600. Letter from Secretary to Military Board, dated 17th January 1840, to J. A. Dorin, Esq. Accountant Revenue Department, in reply to his Letter of the 14th December states, that it is quite contrary to the Board's practice to send back passed Bills to Executive Officers, and the Board request to know whether there is any objection to the Bills when passed being sent direct from the Board's Office to him, the Accountant Revenue Department.

Ditto ditto, No. 7.

No. 601. Letter from Superintendent of Canals, dated 26th December 1839, to Superintending Engineer, S. E. P., transmitting Copy of the Paper marked No. 599, *c.*, and its enclosures, and stating, that by the method proposed by Mr. Dorin, the whole amount of Bills in the Canal, Dredging, and Toll Collection Department, will be chargeable to the Tolls by the Accountant Revenue Department, without any alteration or transfer of items, and only those sums expended in the Iron Bridge Department for the *bona fide* construction of Iron Bridges for the Mofussil, or for the repairs of the Iron Yard, Forges, Overseers' Houses, &c. at Allipore, will be debitable to the Civil Building Department, and that he sees no objection in Mr. Dorin's request.

Ditto 21st January
1840, No. 57.

No. 602. Letter from Superintendent of Canals, dated 30th November 1839, to Secretary to Military Board, transmitting the Papers marked No. 602, *a.* to No. 602, *f.* inclusive and submitting a Financial Report on the Calcutta Canals, for the year ending 31st October 1839.

Ditto ditto, No. 58.

No. 602. *a.* Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October 1839, the former amounting to Rupees 44,608:11:9, and the latter to Rupees 41,828:10:4.

No. 602. <i>b.</i> Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 31st October 1839.	Military Board's Proceedings, 21st January 1840, No. 58.
No. 602. <i>c.</i> Current Expense Bill in Toll Collection Account, for the half year, ending 31st October 1839, amounting to Rupees 2,780:1:4.	Ditto ditto, ditto.
No. 602. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half years, commencing 1st May 1839-40.	Ditto ditto, ditto.
No. 602. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made at the different Toll Houses in the half year, ending 31st October 1839.	Ditto ditto, ditto.
No. 602. <i>f.</i> Comparative Statement of the Number of Boats passing through the Canals, for 6 months, ending 31st October 1839, shewing of large Boats 38,258, and of small 7,609.	Ditto ditto, ditto.
No. 603. Letter from Superintendent of Canals, dated 2nd January 1840, to the Superintending Engineer, S. E. P., reporting, that the Entallee Canal is quite dry at Low Water, and requires to be dug out, which must be done by hand, if the opening of the Cooliah Bridge is too narrow to allow the Hand Dredging Boat to pass through it; this point he will ascertain, should an Estimate be ordered for the above Work.	Ditto ditto, No. 46.
No. 604. Letter from Superintending Engineer, S. E. P. dated 11th January 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 184, for finishing the Dam across the mouth of the Keera-pookreea Khall, [? Kamrapookereah] and recommending that it be passed.	Ditto ditto, No.
No. 605. Letter from Military Board, dated 21st January 1840, to the Deputy Governor of Bengal, transmitting with observations, the Papers marked No. 602, and No. 602, <i>a.</i> to No. 602, <i>f.</i> inclusive.	Ditto ditto, No
No. 606. Letter from Secretary to Military Board, dated 21st January 1840, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals, to furnish an Estimate for excavating the Entallee Canal.	Ditto ditto, No.
No. 607. Letter from Superintendent of Canals, dated 25th January 1840, to Secretary to Military Board, reporting the result of the sales by Auction of the expired Leases referred to in his Letter of the 18th ultimo, marked No. 595, exhibiting an increase of Rupees 239:6:0 of Revenue, and recommending that the new	Ditto, 31st January 1840, No. 25.

Lessee of the Balliaghatta Fisheries be permitted to include the waters of the new Docks within his right of Fishery. ..

Military Board's
Proceedings, 31st
January 1840, No.
26,

No. 608. Letter from Secretary to Military Board, dated 31st January 1840, to Superintendent of Canals, approving of the recommendation contained in his Letter of the 25th instant.

Ditto, 11th Febru-
ary 1840, No. 18.

No. 609. Letter from Superintending Engineer, S. E. P., dated 28th January 1840, to the Secretary to the Military Board, transmitting a Letter from the Superintendent of Canals, No. 298, of the 24th instant, mentioning his receipt of a Letter from W. Prinsep, Esq. in which it is stated, that the Tunnel Drain proposed to be constructed at the Docks would prove injurious to the Balliaghatta Salt Works; and observing, that formerly there was an outlet from the Salt Works direct into the Canal which was closed up by Captain Thomson, who recommended, to prevent injury to the Salt Works, that the indirect mode of communication with the Canal by means of a Tunnel Drain to the Docks should be adopted, but as the Superintendent of the Salt Works is adverse to the Tunnel being executed (he) the Superintending Engineer would therefore recommend that the Estimate sanctioned by Government on the 5th ultimo, for the above work, be cancelled.

Ditto ditto, No. 19.

No. 610. Letter from Secretary to Military Board, dated 11th February 1840, to Superintending Engineer, S. E. P., approving of his suggestion contained in his Letter of the 28th ultimo.

Ditto, 14th Febru-
ary 1840, No. 56.

No. 611. Letter from Superintendent of Canals, dated 4th July 1839, to the Magistrate of the 24-Pergunnahs, reporting, that two Boats had passed the Dhapa Toll Station by force, and were captured after considerable resistance, and made over to six Chowkeydars, who during the night allowed the Boats to be taken away; and stating, that it is quite useless to make seizures of Boats that are liable to be confiscated under Article 9 of Act No. XXII. of 1836, if the Police Authorities are thus negligent of their charge.

Ditto ditto, ditto.

No. 612. Letter from Magistrate of 24-Pergunnahs, dated 26th August 1839, to the Superintendent of Canals, in reply to his Letter of the 4th ultimo, states, that with every desire to assist in the discharge of his duties by means of (his) the Magistrate's Police, and his readiness to punish any instance of proven delinquency on the part of the Officers of the Police, yet he cannot view their conduct in the instance of which (he) the Superintendent complains, in the culpable light he appears to do, and assigns his reasons for the same.

Ditto ditto, ditto.

No. 613. Letter from the Superintendent of Canals, dated the 13th January 1840, to the Secretary to the Military Board, in reply

to his Letter of the 3rd instant, transmits the Papers marked No. 613. *a.* to No. 613. *c.*, and submits a concise Statement of the conservative duties of the Canals, on account of the Establishment required, and a Comparative Statement of Income and Expenditure since he took charge of the Calcutta Canals.

No. 613. <i>a.</i> Comparative Statement of Establishments.	Military Board's Proceedings, 14th February 1840, No. 56.
No. 613. <i>b.</i> Comparative Statement of Collection.	Ditto ditto, ditto.
No. 613. <i>c.</i> Comparative Statement of Boats.	Ditto ditto, ditto.
No. 614. Letter from Superintending Engineer, S. E. P., dated 16th January 1840, to Secretary to Military Board, with reference to his Letter of the 14th October last, transmits the Papers marked No. 614, <i>a.</i> and No. 614. <i>b.</i>	Ditto ditto, No. 57.
No. 614. <i>a.</i> Letter from Superintendent of Canals, dated 18th December 1839, to the Superintending Engineer, S. E. P., submitting the results of his observations and inquiries respecting the Kamapokhurria Dam, which was built by the late Superintendent of Canals in a very substantial manner between two steep Banks of stiff earth, well protected by ballast on the side opposed to the Flood Tide, and stating, it would be expedient to restore the Dam to its original condition.	Ditto ditto, No. 58.
No. 614. <i>b.</i> Letter from Superintendent of Canals, dated 3rd January 1840, to the Superintending Engineer, S. E. P., submitting a Rough Memorandum, amounting to Rupees 825: 8: 7, of the probable cost of putting the Kamapokhurria Dam into an efficient state.	Ditto ditto, No. 59
No. 615. Letter from Secretary to Government of Bengal, dated the 30th January 1840, to Military Board, stating, that the Deputy Governor is pleased with the favorable results exhibited in their report of the Toll Collection during the half year ending 31st October last, and that he will wait the report which the Board were requested to furnish in regard to the question of farming out the Canal Tolls.	Ditto ditto, No. 8.
No. 616. Letter from Superintendent of Canals, dated 10th February 1840, to Secretary to Military Board, stating, that he has obtained a Decree in his the Superintendent's favor on the Plaint filed by Hurdeb Roy Chowdry against Government, for the purchase money of certain Lands for the Balliaghatta Docks.	Ditto ditto, No. 38.
No. 617. Letter from Superintendent of Canals, dated 12th February 1840, to the Secretary to the Military Board, transmitting	Ditto ditto, No. 60.

two Sections recently taken across Kamapokhurria Khal and Tolley's Nullah.

Military Board's
Proceedings, 13th
February 1840, No.

No. 618. Minute by the Chief Magistrate, relative to repairing the Kamapokhurria Dam.

Ditto ditto, No. 61.

No. 619. Letter from the Military Board, dated 14th February 1840, to the Governor of Bengal, transmitting the Papers marked No. 614, to No. 614, *a.* and No. 614, *b.* and No. 617, inclusive, and recommending an outlay of Rupees 825, for repairing the Damage sustained by the Kamapokhurria Dam.

Ditto ditto, No.

No. 620. Letter from Secretary to Military Board, dated 14th February 1840, to Superintendent of Canals, in reply to his Letter of the 13th ultimo, states, that the Board are generally unwilling to recommend increase of Establishments, but they will nevertheless forward his proposal to Government with their recommendation, if on further trial to the end of the present half year, he should then consider the proposed increase indispensable.

Ditto, 18th February 1840, No. 65.

No. 621. Letter from Superintendent of Canals, dated 18th January 1840, to Superintending Engineer, S. E. P., submitting an Estimate amounting to Rupees 483 : 14 : 10, including the materials of the old building, by a Native Mistree for reconstructing the Pauspottah Toll House, and recommending that the Estimate be sanctioned.

Ditto ditto, No.

No. 622. Letter from Secretary to Military Board, dated 18th February 1840, to the Superintendent of Canals, sanctioning the Estimate referred to in his Letter of the 18th January 1840, marked No. 621.

Ditto, 6th March 1840, No.

No. 623. Letter from Superintending Engineer, S. E. P., dated 27th January 1840, to Secretary to Military Board, transmitting an Estimate amounting to Rupees 496, by the Superintendent of Canals, for cleaning out the Durrumtollah Cess Pool, and recommending that the Estimate be sanctioned.

Ditto, 10th March 1840, No. 29.

No. 624. Letter from the Accountant Revenue Department, dated 24th January 1840, to the Secretary to the Military Board, in reply to his Letter of the 17th instant, states, that he has no objection to the Board sending to his Office after audit the Bills submitted to them by the Collector of Calcutta Canals, instead of returning them to the Collector.

Ditto, 24th March 1840, No. 62.

No. 625. Letter from Superintending Engineer, S. E. P., dated 27th December 1839, to Secretary to Military Board, transmitting the Paper marked No. 625, *a.* and stating, that in his opinion

it is unreasonable to expect whilst the Dock Roads and the Road referred to in the above Paper remain in their present condition, that the Docks will be resorted to, and that to induce location and resort, it is necessary to improve the Dock premises by rendering the Roads pukka, and opening a permanent and rapid means of communication with Calcutta; that however he cannot recommend any expenditure beyond that suggested by the Executive Officer, unless the above suggestions be at the same time taken into consideration.

No. 625. a. Letter from Superintendent of Canals, dated 20th December 1839, to Superintending Engineer, S. E. P., stating, that unless the Balliaghatta Docks are more frequented than at present, he does not consider that any advantage would result from the construction of a Pukka Road on the South Bank of the Balliaghatta Canal, and that he would recommend no outlay being incurred at present beyond the trifling repairs required to keep the Cutcha Road passable at all times of the year.

Military Board's
Proceedings, 21th
March 1840, No.
63.

No. 626. Letter from Secretary to Military Board, dated 24th January 1840, to Superintendent of Canals, with reference to his Letter of the 20th ultimo, to the Superintending Engineer, S. E. P., directs his attention to the inconvenience which was supposed to arise from Boats remaining in the Canals, to obviate which, the Balliaghatta Docks were chiefly constructed; that if the Boats are compelled to enter the Docks, it may then be found necessary to construct the Pukka Road on the South Bank of the Balliaghatta Canal.

Ditto ditto, No.

No. 627. Letter from Superintendent of Canals, dated 25th January 1840, to Secretary to Military Board, in answer to his Letter of the 24th instant, states, that much inconvenience would result from Boats being permitted to remain for any length of time in the Canals, and stating, that during the 11 months the Canals have been under his charge, the amount of demurrage on Boats has been only $1\frac{3}{10}$ per cent. on the amount of Toll, so that it would seem that the Canal is very little obstructed by Boats remaining beyond the time allowed them; at the same time it ought not however to be concealed from the Board, that during the above period, that out of 71,997 Tickets that have been issued from the 4 Toll Stations, 7,702 Tickets or $10\frac{7}{10}$ per cent. have never been returned to the Office, owing it is reported, to many of these Tickets having been torn up by the connivance of the former Darogahs to avoid payment of the demurrage due upon them; and from a like circumstance as the above, he fears that there is still something wrong at the Dhapha Station, notwithstanding

Ditto ditto, No. 64.

the very great increase of Toll realized at that place, as out of 37,983 Tickets issued from that Station, 5,497, or more than 14 $\frac{4}{10}$ per cent. are missing; that in order to take away much of the inducement for such fraud; to lessen the inconvenience to Boat Owners, by having their Boats removed either to the Salt Water Lake or to the River; to increase the value of the Ground within the Docks; and to lessen the obstructions to Navigation, he suggests that Boats which have paid Tolls be allowed to remain under certain restrictions, in the Docks without demurrage.

- Military Board's
Proceedings, 24th
March 1840, No.
65. No. 628. Memorandum by the Superintendent of Canals, dated 28th February 1840, submitted to the Military Board, detailing the causes of the Balliaghatta Docks not being more frequently resorted to by Boats; and suggesting certain provisions for relieving the crowded state of the Balliaghatta Canal; also pointing out the necessity for a Pucka Road on the South Bank of the Canal.
- Ditto ditto, No. 66. No. 629. Supplementary Memorandum by the Superintendent of Canals, dated 7th March 1840, submitted to the Military Board, transmitting a Supplementary Statement of Traffic on the South Bank of the Balliaghatta Canal.
- Ditto ditto, No. No. 630. Letter from Secretary to Military Board, dated 24th March 1840, to Superintendent of Canals, with reference to his communication of the 25th January, 28th February, and 7th instant, requests him to publicly notify that Boats are not to pay Toll for the present, for remaining in the Docks, and directs him to report on the effect of this order on the occupation of the Docks, and that in the meantime the Board will postpone the consideration of the proposed Road on the side of the Balliaghatta Canal.
- Ditto, 27th March
1840, No. 28. No. 631. Letter from the Superintending Engineer, S. E. P., dated 9th March 1840, to Secretary to Military Board, transmitting the Paper marked No. 631, a. and with reference to the difficulty of hauling Boats out of the Lock against a strong current, observes, that, that may be overcome by a more simple and less costly manner than that proposed by the Superintendent of Canals, by making the Crews on Board the Boats to haul home upon a rope tied to a stout Post fixed on the shore.
- Ditto ditto, No. 29. No. 631. a. Letter from Superintendent of Canals, dated 29th February 1840, to Superintending Engineer, S. E. P., suggesting an improvement in the present clumsy mode of keeping back the Chitpore Lock Gates in their Cells, and remarking on the danger to which the Gates are exposed by the force of the

Bore, and recommending the construction of a wooden Platform of about 105 feet long and $5\frac{1}{2}$ feet wide, to remedy the difficulty experienced of hauling Boats out of the Lock. . .

- No. 632. Letter from Secretary to Military Board, dated 27th March 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 9th instant, approves of the measures proposed by the Superintendent of Canals, for keeping back in their Cells the Lock Gates at Chitpore, and with reference to the remarks of the Superintending Engineers relative to the construction of wooden Platforms, directs him to carry his suggestion into effect, and if it is not found to answer the end desired, that then the Superintendent of Canals' proposed Platform be again submitted to the Board, with Estimate of expense, &c. . . .

Military Board's
Proceedings, 27th
March 1840, No.

- No. 633. Letter from the Superintending Engineer, S. E. P., dated 22nd March 1840, to the Secretary to the Military Board, transmitting an Estimate by the Superintendent of Canals, amounting to Rupees 4,528 : 10 : 6, of the probable expense of digging the mud out of the Intallee Canal, and recommending that the Estimate be adopted.

Ditto, 31st March
1840, No. 18.

- No. 634. Letter from Secretary to Military Board, dated 30th March 1840, to the Superintendent of Canals, directing him to commence immediately upon cleaning out the Intallee Canal before the Rains make it difficult and expensive, and to defray the expenses of the work from funds in his hands; and stating, that the sanction of Government to the Estimate will be obtained hereafter.

Ditto ditto, No.

- No. 635. Letter from Secretary to Military Board, dated 31st March 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 22nd ultimo, requests him to direct the Superintendent of Canals to furnish a Report as to the circumstances which are supposed to have caused so heavy an Estimate for cleaning out the Entallee Canal, and to state, the rate of Silting since the construction of the Dhurruamtollah Cess Pool, as compared with the Silting before the Cess Pool existed.

Ditto ditto, No. 19.

- No. 636. Letter from Military Board, dated 31st March 1840, to the Governor of Bengal, transmitting the Estimate referred to in the Paper marked No. 633, and recommending that it be sanctioned.

Ditto ditto, ditto.

- No. 637. Letter from Superintending Engineer, S. E. P., dated 4th March 1840, to the Secretary to the Military Board, transmitting an Estimate on which is written the approving signature of the Superintendent of Canals, by Luckynarain Mistree of Sibpore, for rebuilding the Pauspottah Toll House, amounting to Co's. Rupees 483 : 14 : 10.

Ditto, 3rd April
1840, No. 43.

Military Board's Proceedings, 3rd April 1840, No. 5.	No. 638. Letter from Superintendent of Canals, dated the 1st April 1840, to Secretary to Military Board, with reference to his Letter of the 30th ultimo, states, that he regrets that there appears to be no chance of his being able to complete even the half of the work of excavating the Intallee Canal before the Rains, and remarks on the causes which prevent it.
Ditto ditto, No. 6	No. 639. Letter from Secretary to Military Board, dated 3rd April 1840, to Superintending Engineer, S. E. P., with reference to the Superintendent of Canals' Letter of the 1st instant, requests him to direct that Officer to pursue such a course as he may under the present circumstances deem most beneficial for the Navigation of the Canal.
Ditto ditto, No	No. 640. Letter from Military Board, dated 3rd April 1840, to the Governor of Bengal, transmitting the Estimate referred to, in the Paper marked No. 637, and recommending that it to be passed.
Ditto, 21st April 1840, No. 66.	No. 641. Letter from Superintending Engineer, S. E. P., dated 14th April 1840, to the Secretary to the Military Board, transmitting the Paper marked No. 641, <i>a.</i> and stating, that it is so satisfactory, that it needs no remarks from him.
Ditto ditto, No. 67.	No. 641. <i>a.</i> Letter from the Superintendent of Canals, dated the 14th April 1840, to Superintending Engineer, S. E. P., reporting the circumstances which have led to the heavy Estimate of cleaning out the Intallee Canal, and explaining the effect exercised by the Dhurumtollah Cess Pool in preventing the ingress of Silt into the Intallee Canal.
Ditto ditto, No.	No. 642. Letter from Secretary to the Government of Bengal, dated 14th April 1840, to Military Board, stating, that His Lordship approves of their having authorized the execution of the work charged in the Estimate, transmitted in their Letter of the 31st March last, which Estimate has been passed.
Ditto, 19th May 1840, No. 11.	No. 643. Letter from Superintending Engineer, S. E. P., dated 27th April 1840, to Secretary to Military Board, transmitting the Papers marked No. 643, <i>a.</i> and No. 643, <i>a.</i> ⁽¹⁾ and recommending that the improvement suggested be approved.
Ditto ditto, No. 12.	No. 643. <i>a.</i> Letter from Superintendent of Canals, dated 25th April 1840, to Superintending Engineer, S. E. P., transmitting the Paper marked No. 643, <i>a.</i> ⁽¹⁾ and recommending that the suggestion contained therein be carried into effect.
Ditto ditto, No. 12.	No. 643. <i>a.</i> ⁽¹⁾ Letter from Mr. M. Crow, dated 14th April 1840, to Superintendent of Canals, pointing out the inconvenient state of the Balliaghattach Canal Ferry, and the inconvenience which he

suffers therefrom ; and recommending that a Ghaut be erected on each side of the Ferry ; which might be useable at all seasons of the year ; that this could be effected economically by having a passage two feet in breadth going up the Banks on either side in a slanting direction, affording an easy slope, whilst the parts subject to the fluctuations of the Tide, might have a raised a Platform of planks made from broken Boats, which Platform would meet the Ferry Boat at Low Water mark, and that the steps of the slopes could be made with logs of common Soondry wood, fixed by Gourran pins driven into the ground.

- No. 644. Letter from Secretary to Military Board, dated 19th May 1840, to the Superintending Engineer, S. E. P., authorizing the execution of the Ghauts referred to in the Paper marked No. 643, *a.*⁽¹⁾ at an expense of not more than Rupees 80.
 Military Board's Proceedings, 19th May 1840, No. 13
- No. 645. Letter from Superintendent of Canals, dated 20th May 1840, to Superintending Engineer, S. E. P., reporting the difficulty he experiences in visiting the Station of Pauspottah, which lies three miles East of the Gurriah Hath Bridge, and requesting to be permitted to expend a sum not exceeding Rupees 80, for establishing a communication by Land between Gurriah Hath and Pauspottah Toll Station.
 Ditto, 29th May 1840, No. 43
- No. 646. Letter from Secretary to Military Board, dated 29th May 1840, to Superintending Engineer, S. E. P., sanctioning the expense for establishing the Land communication referred to in the Paper marked No. 645.
 Ditto ditto, No
- No. 647. Letter from Superintendent of Canals, dated 8th May 1840, to Secretary to Military Board, transmitting the Papers marked No. 647, *a.* to No. 647, *h.* inclusive, being the usual Financial Returns respecting the Calcutta Canals during the half year, ending 30th April 1840 ; and submitting his observations on the same ; and recommending certain rewards to the Toll Darogahs for the great improvement in the Collection of Toll ; and suggesting the early sanction of Government be obtained for putting the Canal Establishment on a more efficient footing.
 Ditto, 12th June 1840, No. 48.
- No. 647. *a.* Statement of Boats paying Tolls during the whole year, ending 30th April 1840.
 Ditto ditto, ditto.
- No. 647. *b.* Statement of Missing Tickets.
 Ditto ditto, ditto.
- No. 647. *c.* Statement of the Gross and Net Collection of the Tolls on the Canal, from 1st November 1839 to 30th April 1840, the former amounting to Rupees 77,204, and the latter to Rupees 73,731.
 Ditto ditto, No. 49.

Military Board's Proceedings, 12th June 1840, No. 49.	No. 647. <i>d.</i> Explanation of the receipts and expenditure in the Toll Collection Account for the half year, ending 30th April 1840. ..
Ditto ditto, ditto.	No. 647. <i>e.</i> Amount of Current Expense Bill and Toll Collection Account for the half year, ending 30th April 1840.
Ditto ditto, ditto.	No. 647. <i>f.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year, commencing 1st November 1839-40, exhibiting an increase of Rupees 42,440.
Ditto ditto, ditto.	No. 647. <i>g.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made in the different Toll Houses in the half year, ending 30th April 1840.
Ditto ditto, ditto.	No. 647. <i>h.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 30th April 1840, amounting to 58,673 of Boats paying Tolls, and 9,824 small Boats. ..
Ditto ditto, No.	No. 648. Letter from Military Board, dated 12th June 1840, to the Governor of Bengal, transmitting the Papers marked No. 647, and its enclosures, and stating, that they are ready to accede to every request made by the Superintendent of Canals in the above communication.
Ditto, 16th June 1840, No. 11.	No. 649. Letter from Secretary to Government, dated 2nd June 1840, to Military Board, transmitting for their information, the Papers marked No. 649, <i>a.</i> to No. 649, <i>b.</i> inclusive.
Ditto ditto, No. 12.	No. 649. <i>a.</i> Letter from J. P. Grant, Esq. Accountant Revenue Department, dated 19th May 1840, to Secretary to Government of Bengal, transmitting with observation, the Papers marked No. 649, <i>a.</i> ⁽¹⁾ to No. 649, <i>b.</i> inclusive regarding the Cash Accounts of the Superintendent of Canals and the Collector of Tolls, for the order of the Right Honorable the Governor of Bengal. ..
Ditto ditto, ditto.	No. 649. <i>a.</i> ⁽¹⁾ Extract of a Letter from the Revenue Accountant, to the Collector of Tolls, requesting to be informed, whether the balance and petty Account for Fines credited to profit and loss in his Cash Account for February, exhibits the whole of the realizations of Fines levied in that month, or only such portion thereof, as remain after deducting any extraordinary disbursements made from it, as the credit entry would imply. ..
Ditto ditto, ditto.	No. 649. <i>a.</i> ⁽²⁾ Letter from Superintendent of Canals, dated 16th May 1840, to J. P. Grant, Esq. Revenue Accountant, in reply to his Letter of the 13th instant, transmits the Paper marked No. 649, <i>a.</i> ⁽³⁾ and states, that his Cash Accounts do not include the whole amount realized by Fines, but only the balance remaining, after deducting extraordinary disbursements made

from it ; that as he never receives any Salary as Collector of Toll, nor is provided with a sufficient Establishment for the business of his Department, he hopes that it will not be found necessary for him to furnish monthly details of Petty Accounts, but that only the Balance, if any, may be credited to Government according to the present practice... ..

- No. 649. *a.*⁽³⁾ Statement of the Petty Account for Fines, &c. for the month of February 1840, amounting to Rupees 117 : 6 : 0. .. Military Board's Proceedings, 16th June 1840, No. 12,
- No. 649. *b.* Letter from Deputy Secretary to the Government of Bengal, dated the 2nd June 1840, to J. P. Grant, Esq. Revenue Accountant, in reply to his Letter of the 19th ultimo, relative to embodying in the monthly Cash Accounts of the Superintendent of Canals, and Collector of Tolls, the gross amount of Fines collected and disbursed by that Officer, instead of bringing the Net Balance only to credit, states, that the Governor of Bengal entirely concurs in (his) Mr. Grant's opinion, and is pleased to sanction the Plan recommended by him for adoption. Ditto ditto, ditto
- No. 650. Letter from Secretary to Military Board, dated 16th June 1840, to the Superintendent of Canals, transmitting the Paper marked No. 649, and requesting him to insert in his monthly Cash Accounts of Toll Collections, the gross amount of Fines collected, and the amount of Pay to Informers. Ditto ditto, No. 13.
- No. 651. Petition of Cossynauth Paul, resident of Balliaghatta, dated 5th June 1840, to Military Board, stating, that there are Mal-practices carried on by the Toll Darogahs of the Circular Canal at Dhaphah and at Cossypore, and offers his services in exposing the tricks practised in the Collection of Tolls. Ditto, 26th June 1840, No. 35.
- No. 652. Letter from Secretary to Military Board, dated 16th June 1840, to Superintendent of Canals, transmitting the Paper marked No. 651, and requesting a Report thereon. Ditto ditto, No. 36.
- No. 653. Letter from Superintending Engineer, S. E. P., dated 16th June 1840, to Secretary to Military Board, transmitting the Papers marked No. 653, *a.* to No. 653, *f.* inclusive and recommending that they be passed. Ditto, 30th June 1840, No.
- No. 653. *a.* Bill No. 1, by the Superintendent of Canals, amounting to Rupees 436 : 0 : 3, for expense incurred in clearing out the Dhurrumtollah Cess Pool. Ditto ditto, ditto.
- No. 653. *b.* Bill No. 2, by ditto, amounting to Rupees 196 : 12 : 2½, for expense incurred in renewing the Fences for the protection of young trees planted along the Circular Canal. . . . Ditto ditto, ditto.

Military Board's Proceedings, 30th June 1840, No.	No. 653. <i>c.</i> Bill No. 3, by ditto, amounting to Rupees 192 : 14 : 0, for expense incurred in repairing the Kutcha Road on the East Bank of the Circular Canal in the vicinity of Manicktollah. . .
Ditto ditto, ditto.	No. 653. <i>d.</i> Bill No. 4, by ditto, amounting to Rupees 1,204 : 7 : 0, for repairing the Pucka Road on the West Bank of the Circular Canal, between the Balliaghatta and Narcoledangah Bridges, amounting to Rupees 1,204 : 7 : 0.
Ditto ditto, ditto.	No. 653. <i>e.</i> Bill No. 5, ditto, amounting to Rupees 64 : 11 : 3, for mooring Posts along the Banks of the Balliaghatta and Circular Canals, for Boats.
Ditto ditto, ditto.	No. 653. <i>f.</i> Bill No. 6, by ditto, amounting to Rupees 370 : 5 : 6, for strengthening the Proving Machine.
Ditto ditto, No. 74.	No. 654. Letter from Superintending Engineer, S. E. P., dated 16th June 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 229 : 10 : 3, for repairing the Roadway of the Manicktollah Bridge with a brick on edge metalling, and stating, that it remains to be seen what the effect will be of oft recurring Vibrations on the two portions of the metalling of the Road on the Bridge, prepared respectively with and without cement.
Ditto ditto, No. 32.	No. 654 ¹ / ₂ . Letter from J. L. Heatly, Esq. a Government Grantee, dated 24th June 1840, to Superintendent of Canals, requesting permission to take a Copy of the Map of the Eastern Canals by Captain Thomson, as it will prove very serviceable in forming a correct judgement of the capabilities of the Grounds for the improvements which he proposes.
Ditto ditto, No.	No. 655. Letter from Secretary to Military Board, dated 30th June 1840, to Superintending Engineer, S. E. P., stating, that the Board have no objection to the Superintendent of Canal's allowing Mr. Heatly to take a Copy of the Map he requires.
Ditto ditto, ditto.	No. 656. Letter from Secretary to Military Board, dated 30th June 1840, to Superintending Engineer, S. E. P., stating, that the Bills transmitted in his Letter of the 16th instant, have this day been passed by the Board.
Ditto, 3rd July 1840, No. 47.	No. 657. Letter from Superintending Engineer, S. E. P., dated 25th June 1840, to Secretary to Military Board, transmitting a Letter from the Superintendent of Canals, stating, that at the present season the inquiries regarding the proposition of Mr. Heatly for improving the Navigation of certain portions of the Canal communication cannot be prosecuted.

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- No. 658. Letter from Deputy Secretary to Government of Bengal, dated 14th July 1840, to Military Board, in reply to their Letter of the 12th ultimo, considers the results which the Toll Accounts for the last half year, exhibit as satisfactory, and sanctions the additional Establishment recommended by the Board. . .
- No. 659. Letter from Superintending Engineer, S. E. P., dated 30th July 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 109: 13: 4, for constructing Cranes for the Log Dam at Chitpore... .
- No. 660. Letter from Secretary to Military Board, dated 17th July 1840, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals and Agent for Iron Suspension Bridges, to report for the Board's information, the nature and result of all trials of the strength of Bars used in the construction of Bridges under his Superintendence.
- No. 661. Letter from Superintending Engineer, S. E. P., dated 28th July 1840, to Secretary to Military Board, in reply to his Letter of the 17th instant, transmits with observations, the Paper marked No. 661. a.
- No. 661. a. Letter from Agent for Iron Suspension Bridges, dated 25th July 1840, to Superintending Engineer, S. E. P., reporting upon the nature and result of all trials of the strength of Iron Bars, used in the construction of Bridges under his Superintendence, with his remarks thereon.
- No. 662. Letter from Secretary to Military Board, dated 14th August 1840, to the Superintending Engineer, S. E. P., with reference to his Letter of the 28th ultimo, and its enclosure, states that the Report by the Agent of Iron Suspension Bridges is very satisfactory, and sanctions that officer, with the view of making the Proving Machine more perfect, to indent upon the Superintendent of Mathematical Instrument-maker's Establishment, for a pair of brass sliding Gauges of the description required.
- No. 663. Letter from Superintending Engineer, S. E. P., dated 17th July 1840, to Secretary to Military Board, with reference to his Letter of the 19th ultimo, directing, that the Barrackpore Bridge should be kept in good repair, but that no expense should be incurred in substituting a broad Roadway for the two narrow ones, transmits the Paper marked No. 663, a. and observes, that the practice of laying a Stratum of Khoah over the Platforms of Suspension Bridges, without any provision for Drainage, must prove ruinous to the under wood-work.

Military Board's
Proceedings, 4th
August 1840, No. 2.

Ditto, 11th August
1840, No.

Ditto, 14th August
1840, No. 54.

Ditto ditto, No. 55

Ditto ditto, No. 56.

Ditto ditto, No.

Ditto ditto, No. 63

Military Board's
Proceedings, 14th
August 1840, No.
64.

No. 664. Letter from Superintendent of Canals, dated 16th July 1840, to Superintending Engineer, S. E. P., reporting, that the rough Estimate for renewing the wood-work of the Suspension Bridge over the Circular Canal, on the Road leading to Barrackpore, would amount to Rupees 2,788, exclusive of Rupees 165, for raising the floor two feet, and recommending, that his Estimate, forwarded in his Letter of the 12th July 1839, for thoroughly repairing the Bridge, be adopted.

Ditto ditto, No. 65. No. 665. Letter from Secretary to Military Board, dated 14th August 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 17th ultimo, requests him to forward the Estimate by the Superintendent of Canals, for repairing the Suspension Bridge on the Road to Barrackpore, and states, that the Board before recommending the expense of doing away with the foot-path over the above Bridge, and making a broad Roadway, desire further information on the subject.

Ditto ditto, No. 66. No. 666. Letter from Superintending Engineer, S. E. P., dated 28th July 1840, to Secretary to Military Board, transmitting the Paper marked No. 666, a.

Ditto ditto, ditto. No. 666. a. Estimate by the Superintendent of Canals, amounting to Rupees 5,103: 9: 8, for repairing the Bridge over the Circular Canal on the Road to Barrackpore.

Ditto ditto, No. 67. No. 667. Letter from Superintending Engineer, S. E. P., dated 1st August 1840, to Secretary to Military Board, transmitting the Paper marked No. 667, a. and stating, that the foot-path over the Bridge referred to, can hardly in this country be deemed either an advantage or otherwise; but thinks the most advisable proceeding would be, to await the submission of the proposal for improving the Navigation of the Canal by the construction of another pair of Gates under the Bridge in question, in order that the two propositions may be considered together, and that in the meantime, the unsound Planking can be replaced at a cost not exceeding Rupees 450.

Ditto ditto, No. 68. No. 667. a. Letter from Superintendent of Canals, dated 31st July 1840, to Superintending Engineer, S. E. P., explaining the advantages to be derived from substituting a broad Roadway in place of the two narrow ones at the Bridge over the Circular Canal on the Road to Barrackpore, but that as the Military Board, and the Superintending Engineer, do not think the proposed alteration of the Bridge an improvement which would compensate for any large outlay, he has no desire to urge the adoption of his Estimate, as he purposes submitting a proposal for improving the Navigation of the Circular Canal, and the building of another pair of Gates under the Barrack-

pore Bridge, to lessen the risk of inundation from hurting of the Chitpore Lock Gates; that the repairs of the Planking, could, for the present, be made, so as to make the Bridge safe for three or two seasons longer, for a sum not exceeding 450 Rupees.

- No. 668. Letter from Secretary to Military Board, dated 14th August 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 10th instant, sanction for the present the outlay of Rupees 450, for repairing the Planking of the Bridge over the Circular Canal on the Road to Barrackpore.
 Military Board's Proceedings, 14th August 1840, No.
- No. 669. Letter from Superintendent of Canals, dated 18th August 1840, to Superintending Engineer, S. E. P., requesting permission to build huts to be erected on the Canal Banks at intervals of three or two miles, for the accommodation of the seven Burken-dazes added to the present Canal Establishment of 11 Men.
 Ditto, 20th August 1840, No. 27.
- No. 670. Letter from Superintending Engineer, S. E. P., dated 31st August 1840, to Secretary to Military Board, transmitting the Paper marked No. 670, *a.* and stating, that he has directed the Superintendent of Canals, to secure the Bank of Tolley's Nullah in the manner suggested by him, and to furnish an approximate Estimate of the cost.
 Ditto, 1st September 1840, No. 24.
- No. 670. *a.* Letter from Superintendent of Canals, dated 28th August 1840, to Superintending Engineer, S. E. P., reporting, that the late heavy Floods have cut away the Banks of Tolley's Nullah on both sides of the North Abutment of the Iron Suspension Bridge at Gurraah Hath, and that it is essential to repair the damages by means of Piles as early as possible.
 Ditto ditto, No. 65.
- No. 671. Letter from Superintending Engineer, S. E. P., dated 20th August 1840, to Secretary to Military Board, transmitting the Paper marked No. 671, *a.* and with reference to the Road, therein referred to, recommends that it may be made only 15 feet in breadth, which would only cost Rupees 2,625, for the required distance of 3,444 feet.
 Ditto, 4th September 1840, No. 27.
- No. 671. *a.* Letter from Superintendent of Canals, dated 19th August 1840, to Superintending Engineer, S. E. P., transmitting the Paper marked No. 671, *b.*, and with reference to the same. states, that he himself has experienced so much inconvenience from the deep mud on the Road on the North Bank of the Balliaghatta Canal, that he would beg to recommend something be done to render the Road passable during the Rains, at least as far as the Pucka Cross Road, which joins the Great Balliaghatta Road to the Canal a few hundred yards Eastward of the Ferry, and remarking, that the cost of making Pucka of

Ditto, ditto, No. 28

nearly $\frac{1}{2}$ of a mile of Road, 20 feet wide, instead of 24 feet, as stated in the Petition, would be nearly 3,500 Rupees. ..

Military Board's
Proceedings, 4th
September 1840,
No. 28.

No. 671. *b.* Petition, dated 12th Srabun, 1247, or August 1840, from certain Merchants at Culliah Gunge, Balliahghatta, complaining of the bad state of the Kutcha Road on the North Bank of the Balliahghatta Canal, and praying, that the Road may be made Pucka to a distance of 3,444 feet, and 24 feet in width, and stating, that originally there existed a Pucka Road made at an expense of nearly 1,000 Rupees by the Widow of the late Baboo Rajchunder Doss, but in the year 1838, it was destroyed by the Superintendent of Canals, to allow the Sloping of the Bank of the Canal.

Ditto, ditto, No.

No. 672. Letter from Military Board, dated 4th September 1840, to the Government of Bengal, transmitting the Paper marked No. 671, *a.* and No. 671, *b.* and recommending the construction of a Pucka Road on a certain portion of the North Bank of the Balliahghatta Canal, at an expense of Rupees 3,500.

Ditto, 18th Sep-
tember 1840, No.
27.

No. 673. Letter from Superintendent of Canals, dated 12th September 1840, to Superintending Engineer, S. E. P., reporting, that nearly 40 slides have lately taken place in the Banks of the Balliahghatta and Entally Canals, measuring about 520 yards, which he recommends be repaired at an expense of 15 Annas per running yard, or Rupees 487 : 8 : 0 in all.

Ditto ditto, No. 28.

No. 674. Letter from Secretary to Military Board, dated 18th September 1840, to Superintending Engineer, S. E. P., sanctioning the repairs of the Banks of the Balliahghatta and Entally Canals.

Ditto, 22nd Sep-
tember 1840, No.
57.

No. 675. Letter from Superintending Engineer, S. E. P., dated 9th September 1840, to Secretary to Military Board, transmitting the Paper marked No. 675, *a.*

Ditto ditto, No. 58.

No. 675. *a.* Letter from Superintendent of Canals, dated 3rd September 1840, to Superintending Engineer, S. E. P., with reference to Mr. John Scott Russell's method of preventing injury to Iron Suspension Bridges, and other flexible structures, by the vibration or undulation to which they are occasionally exposed by the action of Storms and other causes—observes, that he does not think it necessary to apply Stays to Suspension Bridges of less span than 150 feet, and that he has never observed any dangerous undulation in the Kallee ghaut Bridge, which is 141 feet long, nor in Hastings' Bridge, the central opening of which is 176 feet.

Ditto ditto, No. 6.

No. 676. Letter from Deputy Secretary to the Government of Bengal, dated 15th September 1840, to Military Board, sanctioning

the construction of the Road referred to in their Letter of the 4th instant.

- No. 677. Letter from Superintendent of Canals, dated 24th September 1840, to the Officiating Superintending Engineer, reporting for the information of the Military Board, that the principal Slides which have taken place in the Intallee and Balliaghatta Canals, are not on that portion of the Bank for which Piling was sanctioned by Government on the 3rd December last.
- Military Board's Proceedings, 29th September 1840, No. 48.
- No. 678. Letter from Superintending Engineer, S. E. P., dated 13th October 1840, to the Secretary to the Military Board, transmitting an Estimate by the Superintendent of Canals, amounting to Rupees 2,152 : 8 : 0, of the probable expense of constructing the Pucka Road along part of the North Bank of the Balliaghatta Canal.
- Ditto, 3rd November 1840, No. .
- No. 679. Letter from Military Board, dated 3rd November 1840, to the Governor of Bengal, transmitting the Estimate referred to in the Paper marked No. 678. with their recommendation, that it be sanctioned.
- Ditto ditto, ditto.
- No. 680. Letter from Superintendent of Canals, dated 20th November 1840, to Secretary to Military Board, transmitting the Financial Returns marked No. 679, *a.* to No. 679, *f.* inclusive, relative to the Canal Tolls for the half year, ending 31st October 1840, and remarking, among other observations, that there is at present a steady increase in the amount of Toll, and that the sum realized during this half year, exceeds that of the preceding one, by nearly 19,000 Rupees.
- Ditto, 8th December 1840, No. 35.
- No. 680. *a.* Statement of the Gross and Net Collection of the Tolls on the Calcutta Canals, from 1st May to 31st October 1840, the former amounting to Rupees 63,528 : 13 : 6, and the latter to Rupees 59,388 : 4 : 1.
- Ditto ditto, No. 36.
- No. 680. *b.* Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 31st October 1840.
- Ditto ditto, ditto.
- No. 680. *c.* Amount of Current Expense Bill in Toll Collection Account for the half year as above.
- Ditto ditto, ditto.
- No. 680. *d.* Comparative Statement of the Gross Collection, exclusive of Ferries and Fisheries made in the half year, commencing 1st May 1840-41.
- Ditto ditto, ditto.
- No. 680. *e.* Comparative Statement of the Collection, exclusive of Ferries and Fisheries made at different Toll Houses in the half year, ending as above.
- Ditto ditto, ditto.

Military Board's
Proceedings, 8th
December 1840,
No. 36.

No. 680. *f.* Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 31st October 1840, shewing an increase of Boats paying Toll amounting to Rupees 11,702; and of small Boats 5,049; and of Canoes passing the Russa Station, 1,637.

Ditto ditto, ditto. No. 681. Letter from Military Board, dated 8th December 1840, to Governor of Bengal, transmitting the Papers marked No. 680, No. 680, *a.* to No. 680, *f.* inclusive and recommending that the Rewards proposed to be allowed to certain Darogahs be sanctioned.

Ditto, 6th April 1841, No. 6. No. 682. Letter from Mr. M. Crow, Deputy Collector, Punchanon Gram, dated 30th March 1841, to Secretary to Military Board, stating, that the Maps and other Documents connected with the Lands purchased by the late Canal Committee for the Circular Canal, and which were made over by the Board to the Deputy Collector of Calcutta, having been transferred to him, (Mr. Crow,) to enable him to adjust the accounts of those Lands, he requests to be permitted to inspect the Proceedings and other Records of the late Canal Committee, which are lodged in the Office of the Military Board.

Ditto ditto, No. No. 683. Letter from Secretary to Military Board, dated 6th April 1841, to the Deputy Collector of Punchanon Gram, stating, that the Board have no objection to his examining or copying at their Office the Records referred to in his Letter of the 30th ultimo.

Ditto, 23rd April 1841, No. 24. No. 684. Letter from Superintending Engineer, S. E. P., dated 20th August 1840, to Secretary to Military Board, in reply to his Letter of the 10th ultimo, transmits the Paper marked No. 684, *a.*

Ditto ditto, No. 25. No. 684. *a.* Letter from Superintendent of Canals, dated 18th August 1840, to Superintending Engineer, S. E. P., stating, that he completed the examination of the six Bridges on the Circular Canal, and that he is now engaged with the six others on Tolley's Nullah, and that the result of his examination of the former is, that the Iron Work appears to be in almost all instances, in perfect order.

Ditto ditto, No. 26. No. 685. Letter from Secretary to Military Board, dated 15th September 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 20th ultimo, approves of the expense incurred in effecting the examination of the Bridges.

Ditto, 22nd June 1841, No. 26. No. 686. Letter from Accountant General, dated 16th June 1841, to Secretary to Military Board, with reference to the transfer of the accounts of the Canal Department to the Accountant Revenue

Department, requests that all Bills relating to the said Accounts be in future sent to that Office.

No. 687. Letter from Superintendent of Canals, dated 29th May 1841, to Secretary to Military Board, transmitting with observations, the Financial Returns marked No. 687, <i>a.</i> to No. 687, <i>g</i> inclusive, relative to the Calcutta Canal Tolls during the past half year.	Military Board's Proceedings, 6th July 1841, No. 54.
No. 687. <i>a.</i> Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1840 to 30th April 1841, the former amounting to Rupees 1,02,213 : 3 : 7, and the latter, to Rupees 97,850 : 1 : 5.	Ditto ditto, ditto.
No. 687. <i>b.</i> Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1841.	Ditto ditto, ditto.
No. 687. <i>c.</i> Amount of Current Expense Bill in the Toll Collection Account, for the half year ending as above.	Ditto ditto, ditto.
No. 687. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year, commencing from 1st November 1840, exhibiting an increase of Rupees 24,966 : 4 : 3, over the past half year,	Ditto ditto, ditto.
No. 687. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made at the different Toll Houses in the half year, ending 30th April 1841.	Ditto ditto, ditto.
No. 687. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for six months, ending 30th April 1841, exhibiting of Boats paying Toll Rupees 74,815, and of small Boats Rupees 16,688, and of Canoes at the Russa Station, paying Toll Rupees 16,835, and of small Canoes 669.	Ditto ditto, ditto.
No. 687. <i>g.</i> Return of Tickets-issued to Boats entering the Canals, and of those recovered from Boats quitting the same, shewing the number of Missing Tickets at each Station.	Ditto ditto, ditto.
No. 688. Letter from Superintendent of Canals, dated 22nd June 1841, to Secretary to Military Board, stating, that the present season of the year the Toll Collection usually falls to about $\frac{2}{3}$ of what it amounts to in the cold weather ; and that he therefore, would recommend that no appointment of an Assistant should at present take place ; and that he thinks it would not be expedient to transfer the Collection of Tolls to any other Office, as the Revenue would very likely fall off greatly ; and that he would be more harassed with Appeals or Suits for con-	Ditto ditto, No. 57.

fiscation in his capacity of Superintendent of Canals, instead of being able, as now, to settle them at once in a Summary manner.

Military Board's
Proceedings, 6th
July 1841, No.

No. 689. Letter from Military Board, dated 6th July 1841, to the Governor of Bengal, transmitting the Papers marked No. 687, and its enclosures, and stating, that the actual Toll Collections in the year 1840-41 amounts to Rupees 1,65,742 : 1 : 1, and which, when compared with that of 1839-40, shews an increase of Rupees 43,929 : 4 : 7, and of Rupees 1,05,898 : 15 : 8, as compared with that of 1838-39; that the Collections of the past half year exceeds that of the corresponding half of the preceding year by Rupees 38,684 : 6 : 1.

Ditto, 3rd August
1841, No. 3.

No. 690. Letter from Secretary to the Government of Bengal, dated 20th July 1841, to Military Board, in reply to their Letter of the 6th instant, states, that the result of the last half year's Canal Toll Collections are very satisfactory, and sanctions the suggestions of the Superintendent of Canals, of employing 4 additional Burkundazes and a Mohurir.

Ditto, 17th Sep-
tember 1841, No.
47.

No. 691. Letter from Superintending Engineer, dated 27th August 1841, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in excavating the Mud from the bed of the Intally Canal and from the Dhurrumtollah Cess Pool, amounting to Rupees 3,466 : 9 : 5, and recommending that the same be passed.

Ditto ditto, ditto.

No. 692. Letter from Secretary to Military Board, dated 17th September 1841, to Superintending Engineer, S. E. P., stating, that the Bill referred to in his Letter of the 27th ultimo has this day been passed.

Ditto, 24th Sep-
tember 1841, No.

No. 693. Letter from Superintending Engineer, S. E. P., dated 27th August 1841, to Secretary to Military Board, transmitting a Bill amounting to Rupees 220 : 9 : 0, for repairing the Barrackpore Bridge, and explaining, why the amount of this Bill is only half that of the Estimate.

Ditto, 13th Octo-
ber 1841, No. 25.

No. 694. Letter from Superintendent of Canals, dated 20th September 1841, to Secretary to Military Board, reporting, that he has lately received many applications for the letting of the Fishings at the spare Ground reserved for enlarging the Balliaghatta Docks if necessary; and that he thinks that it would be advisable to put up the Fishery to Auction, where it may realise 75 or 80 Rupees per Annum; and recommending that it be let to Mr. W. Prinsep at 72 Rupees per Annum, who would be a better tenant than the Natives, as he is willing to embank the whole spare Ground to form a Brine Field.

- No. 695. Letter from Secretary to Military Board, dated 13th October 1841, to Superintendent of Canals, in reply to his Letter of the 20th ultimo, authorizing him to Lease out by Public Auction to the highest bidder, the spare Ground referred to in his Letter, on the express understanding that the Lessee give up the Ground when required for public purposes.
- Military Board's
Proceedings, 13th
October 1841, No.
25.
- No. 696. Letter from Superintending Engineer, S. E. P., dated 13th September 1841, to Secretary to Military Board, transmitting a Bill amounting to Rupees 1,743:2:0, by the Superintendent of Canals, for expense incurred in constructing the Pucka Road along the North Bank of the Balliaghatta Canal.
- Ditto 19th October
1841, No.
- No. 697. Letter from Superintendent of Canals, dated 3rd December 1841, to Secretary to Military Board, reporting, that on the 28th October last, he put up to Auction the Lease of the Farm of the spare Ground reserved for enlarging the Balliaghatta Docks, and that the highest bidder was W. Prinsep, Esq. to whom the Lease has been granted from the 1st ultimo, at an Annual Rent of Rupees 271, subject to the conditions detailed in the Military Board's Letter of the 13th October last.
- Ditto, 6th Decem-
ber 1841, No. 21.
- No. 698. Letter from Superintendent of Canals, dated 3rd January 1842, to Secretary to Military Board, reporting, that he has disposed by Public Auction of the Farm of the Circular Canal Ferry, for one year only, for Rupees 451.
- Ditto, 8th January
1842, No. 8.
- No. 699. Letter from Superintendent of Canals, and Collector of Tolls, dated 4th January 1842, to Secretary to Military Board, transmitting correspondence relative to the receipt of Copper Coins in the Public Treasury, and stating, the inconvenience to which the Toll Darogahs are subject from being prohibited from paying any but New Pice into the Collector of 24-Per-gunnah's Treasury; and suggests, that as the Licensed Money-changers of Calcutta are supplied with Copper Money by Government at 64½ pice per Rupee, the Podars at Gurriah Haut, Tollygunge, and elsewhere, be permitted to purchase Pice from the Toll Darogahs at the same rate.
- Ditto ditto, No. 9.
- No. 700. Letter from Secretary to Military Board, dated 8th January 1842, to Superintendent of Canals, and Collector of Tolls, approving of the suggestions contained in his Letter of the 4th instant, but thinks it would be better that the loss sustained in the Old Coin should be deducted from the Toll Collections.
- Ditto ditto, No. 10.
- No. 701. Letter from Superintendent of Canals, dated 13th December 1841, to Secretary to Military Board, transmitting with observations, the Financial Returns marked No. 701. a. to No 701. g.
- Ditto ditto, No. 27.

inclusive relative to the Calcutta Tolls for the half year ending 31st October last, and stating, that the anticipations expressed in the 5th Paragraph of his Letter of the 29th May 1841, have been more than realized.

Military Board's
Proceedings, 8th
January 1842, No.

No. 701. *a.* Statement of the Gross and Net Collection of the Tolls on the Calcutta Canal, from 1st May to 31st October 1841, the former amounting to Rupees 76,319:2:3, and the latter 71,754:8:1.

Ditto ditto, ditto.

No. 701. *b.* Explanation of the (Monthly) Receipts and Expenditure in the Toll Collection Accounts for the half year, ending 31st October 1841.

Ditto ditto, ditto.

No. 701. *c.* Amount of Current Expense Bill in Toll Collection Account for the half year, ending 31st October 1841.

Ditto ditto, ditto.

No. 701. *d.* Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year as above, exhibiting an increase over the like months of the past year, of Rupees 12,828:4:9.

Ditto ditto, ditto.

No. 701. *e.* Comparative Statement of the Collections exclusive of Ferries and Fisheries made at the different Toll Houses, during the half year as above.

Ditto ditto, ditto.

No. 701. *f.* Comparative Statement of the number of Boats passing through the Canals for six months, ending 31st October 1841.

Ditto ditto, ditto.

No. 701. *g.* Return of Tickets issued to Boats, entering the Canal and of those recovered from Boats quitting the same, shewing the number of necessary Tickets at each Station.

Ditto ditto, ditto.

No. 702. Letter from Military Board, dated 8th January 1842, to the Governor of Bengal, transmitting the Paper marked No. 701, and its enclosures, and recommending that the Rewards, proposed by the Superintendent of Canals, be given to the Darogahs.

Ditto, 5th February 1842, No. 3.

No. 703. Letter from Deputy Secretary to the Government of Bengal, dated 25th January 1842, to Military Board, in reply to their Letter of the 8th instant, states, that the results of the Superintendent of Canals' management of Toll Collections are very satisfactory and creditable, and sanctions the Bonus of Rupees 600 to the Toll Darogahs.

Ditto, 26th February 1842, No.

No. 704. Bill by the Superintendent of Canals, for expense incurred in repairing the North Bank of Tolley's Nullah West of Allypore Bridge with piling, amounting to Co's. Rupees 142:11:2.

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- No. 705. Letter from Deputy Collector of Calcutta, dated 25th February 1842, to Secretary to Military Board, requesting to be furnished with a Memorandum, shewing the sums which may have been annually realized upon the Surplus Lands of the Circular Canal, previous to the transfer of the same to his Office, or while they were under the control of the Military Board, Military Board's Proceedings, 16th March 1842, No. 19.
- No. 706. Letter from Secretary to Military Board, dated 14th March 1842, to the Deputy Collector of Calcutta, in reply to his Letter of the 25th ultimo, transmits in original, a List shewing the amount for which the Surplus Lands were leased, prior to the Lease granted by them on the 1st September 1837, to Collychurn Dutt; and states, that the Board are unable, from want of information, to forward a Memorandum, exhibiting the actual sums realized from renting the surplus Canal Lands; but they believe, that he may obtain that information from the Chief Magistrate's Office, as the Leasing of the Lands in question after being approved of by Government, in their Secretary's Letter of the 6th March 1832, were placed under the Chief Magistrate's charge on the 13th of the above month, Ditto ditto, No. 20.
- No. 707. Letter from Superintendent of Canals, dated 6th April 1842, to Superintending Engineer, S. E. P., stating, that the Pucka Road on the North Bank of the Entally Canal requires to have its Metalling renewed, and requests permission to forward an Estimate for laying new Khoa, 6 inches thick, over its whole extent, which is 5,200 ft. by 15 feet, *
Ditto, 16th April 1842, No. 39.
- No. 708. Letter from Secretary to Military Board, dated 14th April 1842, to Superintending Engineer, S. E. P., stating, that the Board approve of the Superintendent of Canals transmitting the Estimate referred to in his Letter marked above as No. 707, Ditto ditto, No.
- No. 709. Letter No. 170, from Major W. R. Fitzgerald, Superintending Engineer, S. E. P., dated 16th May 1842, to Secretary to Military Board, replying to his Letter No. 7741, of the 16th ultimo, and No. 147, of the 11th instant, and transmitting the Papers marked No. 709. a. to No. 709. d. Ditto, 6th July 1842, No. 42
- No. 709. a. Letter No. 3138, from Superintending Engineer, S. E. P., dated 20th April 1842, to Superintendent of Canals, stating, that no Report having been received from his Office since 1837 respecting the Eastern Canals, requests him to furnish information respecting them, Ditto ditto, ditto.
- No. 709. b. Letter No. 314, from Superintendent of Canals, dated 30th April 1842, to Superintending Engineer, S. E. P., replying to his Letter No. 3138, of the 20th instant, Ditto ditto, No. 43.

- Military Board's
Proceedings, 6th
July 1842, No. 42.
- No. 709. *c.* Letter No. 111, from Superintending Engineer, S. E. P., dated 10th May 1842, to Superintendent of Canals, requesting him to state whether, if the proposition contained in the 10th Paragraph of his Letter No. 314, of the 30th ultimo, is sanctioned, he would then be able to visit the Eastern Canals and superintend the improvement of the Navigation,
- Ditto ditto, No. 44. No. 709. *d.* Letter from Superintendent of Canals, dated 11th May 1842, to Superintending Engineer, S. E. P., replying to his Letter of the 10th instant,
- Ditto ditto, No. 45. No. 710. Letter No. 325, from Superintending Engineer, S. E. P., dated 27th May 1842, to Secretary Military Board, in continuation of his Letter No. 170, of the 16th instant, transmits his Observations on the Eastern or Mofussil Canals, and the Superintendent of Canals management of the same,
- Ditto ditto, No. 46. No. 711. Letter No. 1339, from Secretary to Military Board, dated 6th July 1842, to Superintending Engineer, S. E. P., replying to his Letters Nos. 170 and 325, of the 16th and 27th May last, ...
- Ditto, 13th July 1842, No. 44. No. 712. Letter from Superintendent of Canals, dated the 30th May 1842, to Secretary to Military Board, transmitting with observations, seven Financial Returns, marked No. 712. *a.* to No. 712. *g.* relative to the Toll Collection for the half year, ending 30th April last; and stating, that he has fully realized the anticipation referred to in the 9th Paragraph of his Letter of the 13th December 1841, and states, that he attributes the deficiency in the Toll Collection to the late mercantile disasters,
- Ditto ditto, No. 45. No. 712. *a.* Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1841 to 30th April 1842, the former amounting to Rupees 83,879:3:8, and the latter to Rupees 79,661:14:0,
- Ditto ditto, ditto. No. 712. *b.* Explanation of the Receipts and Expenditure in the Toll Collection Account, for the half year, ending as above,
- Ditto ditto, ditto. No. 712. *c.* Amount of Current Expense Bill in the Toll Collection Account, for the half year, ending 30th April 1842,
- Ditto ditto, ditto. No. 712. *d.* Comparative Statement of the Gross Collection, exclusive of Ferries and Fisheries, made in the half year as above, shewing a decrease of Rupees 18,500:12:9 below the like months of 1840-41,
- Ditto ditto, ditto. No. 712. *e.* Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, as above,

- No. 712. *f.* Comparative Statement of the number of Boats passing through the Canals for 6 months, ending as above, exhibiting a decrease at the four principal Stations of Boats, paying Toll, of Rs. 13,760 ; and an increase of small Boats of 3,227 ; and at the Russah Station, an increase of Canoes paying Toll, of 55 ; and of small Canoes 80.
- No. 712. *g.* Return of Tickets issued to Boats entering the Canal, including duplicates, and of those recovered from Boats quitting the same, including Boats broken up, bamboo rafts, &c., shewing the number of Missing Tickets at each Station.
- No. 713. Letter from Military Board, dated 12th July 1842, to the Deputy Governor of Bengal, transmitting the Papers marked No. 709, and its enclosures, with their remarks thereon.
- No. 711. Letter from Superintendent of Canals, dated 11th July 1842, to Secretary to Military Board, requesting permission to advertise the re-sale of the Lease of the Ghoonee Magee Canal Fisheries, &c. on the line of the Eastern Canals.
- No. 715. Letter from Secretary to Military Board, dated 18th July 1842, to Superintendent of Canals, approving of the suggestion referred to in his Letter of the 11th instant.
- No. 716. Letter from Deputy Secretary to Government of Bengal, dated 25th July 1842, to the Military Board, in reply to their Letter of the 12th instant, sanctions the Bonus of Rupees 500 to three Darogahs ; and with reference to increasing the Salaries of those Officers suggested by the Superintendent of Canals, request the Board to call upon that Officer for his reasons more at large, for recommending such increase.
- No. 717. Letter from Secretary to Military Board, dated 4th August 1842, to Superintendent of Canals, requesting him to state the grounds upon which he recommends an increase to the Salary of the Toll Darogahs.
- No. 718. Letter from Superintending Engineer, S. E. P., dated 12th August 1842, to Secretary to Military Board, stating that much injury has been done to the South Bank of the Balliaghatta Canal by the late rains ; and that the Superintendent of Canals apprehends, it will be necessary to sacrifice the Carriage Road on the South Bank of the Intally and Balliaghatta Canals, in order to repair the above damage, unless considerable expense is incurred in piling and building a Wharf near the Jemmadar Station ; and that the repairs of the Slips must be postponed to the cold weather ; in the meantime, the Superintendent of Canals can be directed to submit an Estimate for the above.

Ditto ditto, ditto.

Ditto ditto, No. 46.

Ditto, 20th July
1842, No. 27.

Ditto ditto, No.

Ditto, 6th August
1842, No. 7.

Ditto ditto, No.

Ditto, 26th August
1842, No. 23.

- Military Board's
Proceedings, 20th
August 1842, No.
- No. 719. Letter from Secretary to Military Board, dated 18th August 1842, to Superintending Engineer, S. E. P., approving of the suggestions contained in his Letter of the 12th instant. ...
- Ditto, 27th August
1842, No. 82.
- No. 720. Letter No. 913, from Superintending Engineer, S. E. P., dated 22nd July 1842, to Secretary to Military Board, transmitting with observations the Paper marked No. 720 *a.* and recommending the transfer of the Canal Tolls to the civil authorities.
- Ditto ditto, No. 83.
- No. 720. *a.* Letter No. 75, from Superintendent of Canals, dated 21st July 1842, to Major W. R. Fitzgerald, Superintending Engineer, S. E. P., stating the nature and extent of the several appointments under his executive charge.
- Ditto ditto, ditto.
- No. 721. Letter No. 2456, from Secretary to Military Board, dated 25th August 1842, to Superintending Engineer, S. E. P., replying to his Letter No. 913, of the 22nd ultimo.
- Ditto, 26th October
1842, No. 15.
- No. 722. Letter from Secretary to Government of Bengal, dated 10th October 1842, to Military Board, in continuation of his Letter of the 25th July last, requests them to furnish a Comparative Statement* of Collections and Expenditure on account of the Tolls, and the purposes to which they are applicable from the furthest period, that it may be seen how far the Government has gained or lost by the Tolls.
- * See Appendix J.
No. XXXIX,
page 145.—J. M.
- Ditto ditto, No. 16.
- No. 723. Letter from Military Board, dated 24th October 1842, to the Deputy Governor of Bengal, in reply to Mr. Secretary Halliday's Letter of the 10th instant, states, that the information requested in that communication will be submitted to Government as soon as the Board have obtained a Statement, referring to the period when the Toll Collections were under the control of the Board of Revenue.
- Ditto ditto, No.
- No. 724. Letter from Secretary to Military Board, dated 24th October 1842, to Secretary to Revenue Board, requesting to be furnished with a Statement of the Gross Collections, the Outlay, and the Net Balance accruing to Government from the Circular and Eastern Canals and Tolley's Nullah for each year, previous to their coming under the charge of the Military Board in November 1836.
- Ditto ditto, No. 47.
- No. 725. Letter from Superintending Engineer, S. E. P., dated 14th September 1842, to Secretary to Military Board, transmitting the Paper marked No. 725 *a.* and stating, that he is disposed to concur generally in opinion with the Superintendent of Canals, with respect to being unfavorable to the system of Farming the Tolls on the Canals; but thinks if an exception could any where be made, it is to the Farming of the Tolls on the Canals in the vicinity of Calcutta.

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Military Board's
Proceedings, 26th
October 1842, No.

- No. 725. a. Letter from Superintendent of Canals, dated 12th September 1842, to Superintending Engineer, S. E. P., submitting his sentiments on the Farming of the Canal Tolls, with reference to the Secretary to Military Board's Letter, No. 2,456, of 25th August 1842, to the Superintending Engineer, S. E. P. ...
- No. 726. Letter from Secretary to Military Board, dated 26th October 1842, to Superintending Engineer, S. E. P., in reply to his Letter of the 14th September last, states, that the Board, on a consideration of the Papers before them, have decided against any present alteration in the system of Toll Collection now in force.
- No. 727. Letter from Superintendent of Canals, dated 27th October 1842, to Secretary to Military Board, transmitting with his recommendation, a Letter from Messrs. Carr, Tagore and Co., requesting that Mr. Prinsep's Lease of the Fishery near the Balliaghatta Dock, which expires on the 31st instant, may be renewed for another year.
- No. 728. Letter from Secretary to Military Board, dated 1st November 1842, to Superintendent of Canals, with reference to his Letter of the 27th ultimo, sanctions the renewal of Mr. Prinsep's Lease for another year.
- No. 729. Letter from Superintendent of Canals, dated 6th November 1842, to Secretary to Military Board, reporting, that the Leases of the Ferries and Fisheries of the Calcutta Canals will expire on the 31st instant, and requesting permission to advertise them.
- No. 730. Letter from Secretary to Military Board, dated 10th December 1842, to Superintendent of Canals, sanctioning the suggestion contained in his Letter of the 6th ultimo, marked No. 729. ...
- No. 731. Petition of Goluckchunder Gustdar, dated , to Military Board, bringing to notice a case of Fraud against the Toll Darogah at Dhapa Chowkee.
- No. 732. Letter from Secretary to Military Board, dated 10th December 1842, to Superintendent of Canals, transmitting the Paper marked No. 731, and requesting him to report thereon. ...
- No. 733. Letter from Superintendent of Canals, dated 15th December 1842, to Secretary to Military Board, with reference to his Letter of the 10th instant, submits an explanation, and states, that he thinks the charges in the Petition are mere fabrications got up to ruin the character of one of his (the Superintendent's) best Toll Darogahs.

Ditto ditto, No.

Ditto, 2nd November 1842, No. 15.

Ditto ditto, No.

Ditto, 10th December 1842, No. 18.

Ditto ditto, No.

Ditto, 24th December 1842, No. 17.

Ditto ditto, No. 18.

Ditto ditto, No. 19.

- **Military Board's**
Proceedings, 21th
December 1842,
No. 22.
- No. 731.** Letter from Superintendent of Canals, dated 17th December 1842, to Secretary to Military Board, transmitting further proof of the Charges contained in Goluckchunder's Petition being false. ...
- Ditto ditto, No 23. **No. 735.** Letter from Secretary to Military Board, dated 24th December 1842, to Superintendent of Canals, stating, that the explanation offered by him, with reference to the Petition of Goluckchunder Gustdar, appears quite satisfactory, and the Petitioner has been recommended to prefer his complaint to him, the Superintendent, in person.
- Ditto ditto, No 25. **No. 736.** Letter from Superintending Engineer, S. E. P., dated 14th December 1842, to Secretary to Military Board, with reference to the Board's Letter of the 22nd December 1841, transmits a Sketch of the South Bank of Tolley's Nullah, between Kidderpore and Allypore Bridges, by the Superintendent of Canals, and states, that there is no Ground except a small portion of Khas Land belonging to Government on the South Bank of Tolley's Nullah; but that the Crews of Boats may make use of the North Bank of the Canal as a Towing-path, and that there is no absolute necessity for the formation of a new Towing-path on the South Bank of Tolley's Nullah, and recommends that the Estimate, dated October 1841, for the above, be cancelled.
- Ditto ditto, No. **No. 737.** Letter from Secretary to Military Board, dated 22nd December 1842, to Superintending Engineer, S. E. P., stating that the Estimate referred to in his Letter of the 14th instant, has been cancelled.
- Ditto, 21st January 1843, No. 66. **No. 738.** Letter from Capt. W. M. Smyth, Engineer, Officiating Collector of Tolls, dated 11th January 1843, to the Secretary to the Military Board, reporting his having received charge from Captain Boileau of the office of Collector of Tolls on the Calcutta Canals.
- Ditto, 4th February 1843, No. 22. **No. 739.** Letter from Capt. A. H. E. Boileau, Collector of Tolls, dated 24th, December 1842, to Secretary to Military Board, transmitting for the favourable consideration of the Board, a Petition from a Native Merchant, respecting the sale of his Boat which had sunk in the Balliaghatta Canal, laden with lime, and the heavy demurrage charged by the Government on the above Boat.
- Ditto ditto, ditto. **No. 740.** Letter from Secretary to Military Board, dated 12th January 1843, to the Superintendent of Canals, in reply to his Letter of the 24th ultimo, authorizing him to refund to the petitioner, Nittiroy, the amount suggested in his, the Superintendent of Canals, above communication marked No. 739.

- No. 741. Letters from the Military Board, dated 12th January 1843, to the Deputy Governor of Bengal, transmitting the Paper marked No. 739, and stating, that they have, in anticipation of His Honor's approval, authorized the Superintendent of Canals to refund to the petitioner Nittiroy the amount proposed by the above Officer.
- Military Board's
Proceedings, 4th
February 1843,
No. 23.
- No. 742. Letter from Officiating Superintendent of Iron Suspension Bridges, dated 3rd February 1843, to Secretary to Military Board, reporting that the outer Gate of the Chitpore Lock will not work properly owing to the heel-post having sunk about 3 inches, in which state it has been several months, but could not be repaired during the Freshes, and that to repair the above will cost* about 90 Rs., and the passage through the Lock will be stopped 10 or 15 days.
- Ditto, 8th Febru-
ary 1843, No. 31.
- * Sanctioned un-
der Board's Letter,
No. 6317, of 7th
Feb. 1843.—J. M.
- No. 743. Letters from Superintendent of Canals, dated 21st January 1843, to the Secretary to the Military Board, transmitting the Financial returns marked No. 743. a. to No. 743. g. inclusive, relative to the Canal Tolls for the half year, ending the 31st of October 1842, and stating, that he believes those returns fully realize the anticipations made regarding them, notwithstanding the disastrous Hurricane of the 3rd of June last; that a change has been introduced in the system of farming out the Ferries, Fisheries, &c. of the Moffussil Canals, the rents of which are now paid monthly instead of quarterly as heretofore, and are leased out from year to year instead of upon terms of three to five years, so that a public competition takes place annually, and Government have already derived considerable benefit from this arrangement, as will be reported separately in notifying to the Military Board the result of the sale by Auction of the Ferries and Fisheries on Tolley's Nullah, and on the Circular Canal, the leases of which are only current up to the 31st December 1842, and stating, that the total decrease during the half year has, as usual, been distributed in a very dissimilar manner among the different Toll Stations, and that he is inclined to think, that this is a very considerable criterion of the efficiency and trust worthiness of the respective *Daroghas*. ..
- Ditto, 24th March
1843, No. 58.
- No. 743. a. Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May 1842 to 31st October 1842, the former amounting to Rs. 70,648:13:6, and the latter to Rs. 66,357:14:4.
- Ditto ditto, No. 59.
- No. 743. b. Explanation of the Receipt and Expenditure in the Toll Collection Account, for the half year, ending as above.
- Ditto ditto, No.
- No. 743. c. Amount of Current Expense Bill in Toll Collection, for the half year, ending 31st October 1842.
- Ditto ditto, No.

Military Board's Proceedings, 24th March 1843, No.	No. 743. <i>d.</i> Comparative Statement of the gross Collections, exclusive of Ferries and Fisheries, made in the half year as above, showing a deficiency of Rs. 5,963 : 11 : 3, or—7 : 9 per cent.
Ditto ditto, No.	No. 743. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Stations during the half year, ending as above.
Ditto ditto, No.	No. 743. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 31st October 1842, showing a decrease in four principal stations of Boats paying Toll of 5,010, and of small Boats 1,380 and of Canoes at the Russah station paying Toll, an increase of 3,425, and of small Canoes 444. ..
Ditto ditto, No.	No. 743. <i>g.</i> Return of Tickets issued to Boats entering the Canal, including duplicates, and of those recovered from Boats quitting the same, including Boats broken up, Bamboo Rafts, &c. shewing the number of missing Tickets at each station.
Ditto ditto, No.	No. 744. Letter from Military Board, dated 23rd March 1843, to Deputy Governor of Bengal, transmitting the Papers marked No. 743. No. 743. <i>a.</i> to No. 743. <i>g.</i> and its enclosures, with their remarks thereon.
Ditto, 31st March 1843, No. 50.	No. 745. Letter from Officiating Collector of Tolls, dated 22nd March 1843, to Secretary to Military Board, reporting on the ill conduct of the Toll Darogah at Dhapa, and transmitting correspondence connected therewith.
Ditto, 4th April 1843, No. 31.	No. 746. Letter from Capt. W. M. Smyth, Officiating Superintendent of Canals, dated 30th March 1843, to Secretary to Military Board, reporting his having this day made over charge of the Canals and Bridge Departments to Captain H. Goodwyn, of the Corps of Engineers.
Ditto, 18th April 1843, No. 80.	No. 747. Letter from Captain H. Goodwyn, Officiating Superintendent of Canals, dated 13th April 1843, to Secretary to Military Board, reporting his intention of proceeding on the 17th instant to inspect the Soondurbun Canals.
Ditto, 25th April 1843, No. 47.	No. 748. Letter from Officiating Superintendent of Canals, dated 13th April 1843, to Superintending Engineer, S. E. P., reporting that the bed of the Entally Canal is 3 feet 9 inches above that of the Circular Canal at the junction, that the above causes demurrage to Boats, whilst the effluvia from the Canal causes nausea and sickness.
Ditto ditto, No. 48.	No. 749. Letter from Superintending Engineer, S. E. P., dated 19th April 1843, to Secretary Military Board, states, that the Superintendent of Canals reports that the clearance of the Intallee Canal could not be effected before the rains, as the work will take fully three months, and this being the cultivating season,

sufficient coolies could not be had, and recommends the work be deferred till November next.

- No. 750. Letter from Officiating Superintendent of Canals, dated 7th April 1843, to the Secretary to the Military Board, reporting on the delinquencies of the Dhappa Toll Darogah. Military Board's Proceedings, 28th April 1843, No. 20.
- No. 751. Letter from Officiating Collector of Tolls, dated 8th April 1843, to the Secretary Military Board, reporting the cause of reduction of Toll at Dhappa Chowkey, and recommending the removal of the Darogah. Ditto ditto, No. 21.
- No. 752. Letter from Officiating Collector of Tolls, dated 13th April 1843, to Secretary Military Board, explaining the cause of the Dhappa Darogah's removal from Office. Ditto ditto, No. 24.
- No. 753. Letter from Officiating Collector of Tolls, dated the 22nd April 1843, to the Secretary to the Military Board, referring a question respecting the limit of the Calcutta Canals, free to the holder of a Ticket. Ditto, 12th May 1843, No. 101.
- No. 754. Letter from Secretary to the Military Board, dated 12th May 1843, to the Superintendent of Canals, replying to his Letter of the 22nd instant. Ditto ditto, ditto.
- No. 755. Letter from Superintending Engineer, S. E. P., dated 11th May 1843, to the Secretary to the Military Board, transmitting with observations the Paper marked No. 755. a. .. Ditto, 6th June 1843, No. 79.
- No. 755. a. Letter from Officiating Superintendent of Canals, dated 23rd April 1843, to Superintending Engineer, S. E. P., reporting on the Eastern Canals and Tolley's Nullah, and works connected therewith. Ditto ditto, No. 80.
- No. 756. Letter from Officiating Superintendent of Canals, dated 1st June 1843, to the Secretary Military Board, reporting his having leased out the Fishery of the Chultabaria and Bhangor Canal for one year, for 350 Rupees. Ditto ditto, No. 72.
- No. 757. Letter from Secretary Military Board, dated the 6th June 1843, to Superintending Engineer, replying to his Letter of the 11th ultimo. Ditto ditto, ditto.
- No. 758. Letter from Officiating Collector of Tolls, dated 6th July 1843, to the Secretary to the Military Board, requesting permission to establish a subordinate Toll Station at a village situated a mile up the Kamarpokeria Khall. Ditto, 18th July 1843, No. 32.
- No. 759. Letter from Secretary Military Board, dated 15th July 1843, No. 1762, to the Officiating Collector of Tolls, replying to his Letter of the 6th July 1843. Ditto ditto, No. 33.

Military Board's Proceedings, 18th July 1843, No. 101.	No. 760. Letter from Officiating Collector of Tolls, dated 14th June 1843, to the Secretary to the Military Board, suggesting measures for remedying the great loss to the Revenue from the destruction of half Tickets upon which demurrage or Tolls are due, often to a considerable amount.
Ditto ditto, ditto.	No. 761. Letter from Secretary Military Board, dated 15th July 1843, to the Officiating Collector of Tolls, replying to his Letter of the 14th ultimo.
Ditto, 28th July 1843, No. 32.	No. 762. Letter from Superintending Engineer, S. E. P., dated 22nd July 1843, to Secretary to Military Board, stating, that Capt. Goodwyn reports that the cracks in the Wing-walls of the Tolleygung Bridge may be attributed to the Original Settlement of the masonry.
Ditto, 15th August 1843, No. 33.	No. 763. Letter from Superintending Engineer, S. E. P., dated 7th August 1843, to Secretary Military Board, states, that Capt. Goodwyn reports his having disposed of the six old Mud Boats for Rs. 270.
Ditto, 25th August 1843, No.	No. 764. Letter from Superintending Engineer, S. E. P., dated 26th July 1843, to the Secretary Military Board, transmitting a Bill amounting to Co's. Rs. 128 : 2 : 0, for repairing the North Bank of the Intallee Canal with rough piling.... ..
Ditto, 5th September 1843, No. 115.	No. 765. Letter from Officiating Collector of Tolls, dated 21st June 1843, to the Secretary Military Board, transmitting the Papers marked No. 765. a. to No. 765. g.
Ditto ditto, ditto.	No. 765. a. Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1842 to 30th April 1843. ...
Ditto ditto, ditto.	No. 765. b. Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1843.
Ditto ditto, ditto.	No. 765. c. Amount of Current Expense Bill in Toll Collection Account, for the half year, ending 30th April 1843.
Ditto ditto, ditto.	No. 765. d. Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year, commencing from 1st November 1842 to 1st May 1843.
Ditto ditto, ditto.	No. 765. e. Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, ending 1st May 1843.
Ditto ditto, ditto.	No. 765. f. Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 30th April 1843.
Ditto ditto, No. 117.	No. 765. g. Statement of Tickets issued to Boats entering the Canals, including duplicates, and of those received from Boats quit-

ting the same, including Boats broken up, Bamboo Rafts, &c.,
showing the number of missing Tickets at each station. . .

- No. 766. Letter from Officiating Collector of Tolls, dated 1st August 1843, to Secretary Military Board, stating his inability to recommend any donations to Toll Darogahs. Military Board's Proceedings, 5th September 1843, No. 117.
- No. 767. Letter from Military Board, dated 5th September 1843, to the Deputy Governor of Bengal, transmitting the Papers marked No. 765. *a.* to No. 765. *g.* inclusive. Ditto ditto, ditto
- No. 768. Letter from Superintending Engineer, S. E. P., dated 11th August 1843, to the Secretary to the Military Board, referring to his Letter No. 988, of the 6th June last, transmits with observations the Papers marked No. 768. *a.* to No. 768. *c.* inclusive Ditto, 12th September 1843, No. 63.
- No. 768. *a.* Estimate dated 30th June 1843, by the Officiating Superintendent of Canals, of the probable expense of cutting Jungle, repairing and remaking Tow-paths and by Draining Cuts, completing the tracking communication along the Eastern Canals, with reference to Orders of Military Board, contained in Superintending Engineer's Letter No. 533, of 12th June 1843. Ditto ditto, ditto.
- No. 768. *b.* Estimate dated 11th August 1843, by the Officiating Superintending Engineer, S. E. P., of the probable expense of cutting Jungle, repairing and remaking Tow-paths. Damming cuts, and completing the tracking communication along the Eastern Canals, amounting to Company's Rupees 4,365 : 11 : 10. Ditto ditto, ditto.
- No. 768. *c.* Estimate No. 7, by the same Officer, of the probable expense of Damming up the Gobrah Khall, amounting to Company's Rupees 5,347 : 6 : 0. Ditto ditto, ditto.
- No. 769. Letter from Military Board, dated the 9th September 1843, to the Deputy Governor of Bengal, transmitting the Papers marked No. 768, and No. 768. *a.* to No. 768. *c.* inclusive. Ditto ditto, ditto.
- No. 770. Letter No. 3194, from Secretary Military Board, dated 9th September 1843, to Superintending Engineer, S. E. P., in reply to his Letter No. 1247, of the 11th August 1843 last, states, that the Board doubts the practicability of bunding up the Gobra Khal, and with reference to former correspondence on the subject they request him to furnish to the Superintending Engineer, the Papers noted on the margin,* with the view to enable him and Captain Goodwyn to investigate the expediency of damming the Khall in question ; and stating, that the Estimate for making improvements to the Soondurbun Canals has been this day recommended to Government.

* Proceedings
14th April 1837,
Paper E. 16th June
1837, P.

- Military Board's
Proceedings, 29th
Dec. 1843, No. 61.
- No. 771. Letter from Superintending Engineer. S. E. P. dated 26th September 1843, to Secretary to Military Board, transmitting Captain Boileau's Bills for constructing an Iron Suspension Bridge over the Circular Canal at Ooltadangah.
- Ditto, 19th January
1844, No. 33.
- No. 772. Letter from Superintendent of Canals, dated 4th December 1843, to the Secretary to the Military Board, transmitting the Papers marked No. 772 *a.* to No. 772 *g.* inclusive, and stating, that the cause of the decrease of Tolls in Tolley's Nullah and Baliaghatta Canal is owing to the difficulty of getting large Boats through the former Channel and to the greater consumption of coals instead of firewood, and to the closing of several rum distilling establishments, and remarking upon certain missing Tickets.
- Ditto ditto, No. 34
- No. 772. *a.* Statements of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October 1843, the former amounting to Rs. 66,997 : 2 : 3, and the latter to Rs. 63,000 : 15 : 1....
- Ditto ditto, ditto.
- No. 772. *b.* Explanation of the receipt and expenditure in the Toll Collection Account for the half-year, ending as above.
- Ditto ditto, ditto
- No. 772. *c.* Amount of Current Expense Bill in Toll Collection Account for the half year, ending the 31st October 1843.
- Ditto ditto, ditto
- No. 772. *d.* Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year as above, showing the increase and decrease, between the like months of 1842-43.
- Ditto ditto, ditto.
- No. 772. *e.* Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses, in the half year, ending as above.
- Ditto ditto, ditto
- No. 772. *f.* Comparative Statement of the number of Boats passing through the Canal for 6 months, ending 31st October 1843. ..
- Ditto ditto, ditto.
- No. 772. *g.* Return of Tickets issued to Boats entering the Canals, including duplicates and of those recovered from Boats quitting the same, including the Boats, Bamboo Rafts, &c., showing the number of missing Tickets at each station. .. .
- Ditto ditto, No
- No. 773. Letter from Military Board, dated 17th January 1844, to the Deputy Governor of Bengal, transmitting with observations the Papers marked No. 772 No. 772 *a.* to No. 772 *g.* inclusive.
- Ditto ditto, ditto.
- No. 774. Letters from Secretary to the Military Board, dated 17th January 1844, to Captain Goodwyn, Superintendent of Canals, in reply to his Letter marked No 772, states, that as Captain Rutherford's whole time and attention can be applied to the careful management of the Toll Department, all errors of Collection are to be remedied, and any perculation of the Darogahs brought to light.

*List of Papers subsequently obtained and omitted to be inserted in the
Index of Appendix to Appendix H.*

	PAGE	
No. 28. <i>a</i> . Abstract of Boats passing through the Bhaminghatta and Bhoj- digee Canals,		Military Board's Proceedings, 3rd May, 1831, No. 20.
No. 38½. Minute by D. McFarlan, Esq., on the Papers marked Nos. 36 and 36 <i>a</i> ,		Ditto 17th May 1831.
No. 95½. Letter dated 26th November 1831, from the Superintendent of Canals to Secretary to Military Board, adverting to his Letter of the 9th May, on the subject of the Lock Gates.		Ditto ditto, ditto.
No. 96½. Minutes of the Members recorded on the 17th May 1831, with reference to the Papers marked Nos. 28, 34 and 87 <i>a</i> , in this Appendix,		Ditto 10th July 1832.
No. 96½. Minutes of the Members recorded on the 10th July 1832, with reference to the Papers marked Nos. 95, 95 <i>a</i> and No. 95½, ..		Ditto ditto, ditto.
No. 97. <i>a</i> . Estimate for constructing a double Lock passage for the Circular Canal, amounting to Rs. 90,912,		Ditto ditto, ditto.
No. 97½. Minutes recorded by the Members of the Military Board, on the Papers marked Nos. 97 and 97 <i>a</i> ,		Ditto ditto, ditto.
No. 99½. Minutes recorded by the Members of the Military Board on the Papers marked Nos. 98 to 99b½,		Ditto ditto, ditto.
No. 101½ <i>a</i> . Minutes recorded by the Members of the Military Board with reference to the Papers marked Nos. 101½ <i>a</i> to 101½ <i>f</i> , ..		Ditto ditto, ditto.
No. 325½. Letter from Superintending Engineer, L. P., dated 19th March 1835, to the Secretary to the Military Board, transmitting with observations the Papers marked Nos. 325½ <i>a</i> to No. 325½ <i>d</i> ⁽¹⁾ inclusive,		Ditto 15th De- cember 1835, No. 43.
No. 325½ <i>a</i> . Letter from Superintendent of Canals, dated 1st April 1835, to Superintending Engineer, L. P., reporting upon the Calcutta and Sunderbund Canals under his charge,		Ditto ditto, ditto.
No. 325½ <i>b</i> . Letter from Superintendent of Canals, dated 10th April, to Superintending Engineer, L. P., in continuation of the 12th para. of his Letter of the 1st instant, marked No. 325½ <i>a</i> , states the evil consequences of the present system of managing the Canals by making the necessary repairs on separate Estimates,		Ditto ditto, ditto.
No. 325½ <i>c</i> . Letter from Superintending Engineer, L. P., dated 4th May 1835, to Superintendent of Canals, replying to his two Letters marked Nos. 325 <i>a</i> and 325 <i>b</i> ,		Ditto ditto, ditto.

Military Board's Proceedings, 15th December 1835, No. 43.	No. 325½d. Letter from Superintendent of Canals, dated 7th May 1835, to Superintending Engineer, L. P., in reply to his letter of the 4th instant, transmits the Papers marked No. 325½d and No. 325d ⁽¹⁾ ,
Ditto ditto, ditto.	No. 325d ⁽¹⁾ Abstract statement of the several works necessary for putting in repair the Canals and works connected with them,
Ditto ditto, ditto.	No. 328½. Letter from Superintending Engineer, L. P., dated 3rd December 1835, to Secretary to Military Board, transmitting the Paper marked No. 329,
Ditto 22nd De- cember 1835, No. 59.	No. 329¼. Letter from Secretary to the Military Board, dated 22nd December 1835, to Superintending Engineer, L. P., stating in reply to his Letter of the 3rd instant, that the Board consider Capt. Thomson's report upon the progress made in constructing the Tow-paths on the Lake Channel very unsatisfactory, and requesting him to call upon Capt. Thomson for further information,
Ditto ditto, ditto.	No. 329½. Letter from the Military Board, dated 22nd December 1835, to the Governor of Bengal, in reply to Secretary Mr. Prinsep's Letter No. 311, dated 11th ultimo, transmits the Paper marked No. 329,
Ditto 1st March 1836, No. 19.	No. 334a. Report dated 20th January 1836, by Overseer J. Greene to D. McFarlan, Esq., respecting the stoppage (owing to the dredging of the Entally Canal) of the Dhurrumtollah Drain, and its effects on the Drains in its neighbourhood, and the insalubrity caused thereby,
Ditto ditto, ditto.	No. 334b. Letter from D. McFarlan, Esq., dated 20th January 1836, to Capt. J. Thomson, bringing to his notice the offensive state of the Dhurrumtollah Drain,
Ditto ditto, ditto.	No. 334c. Report dated 24th February 1836, by Overseer J. Greene to D. McFarlan, Chief Magistrate, respecting the continued stoppages of the Dhurrumtollah Drain,
Ditto ditto, ditto.	No. 334d. Letter from J. Prinsep, Esq., (no date) to D. McFarlan, Esq., respecting the stoppage of the Dhurrumtollah Drain, ..
Ditto ditto, ditto.	No. 336½. Letter from Secretary to Military Board, dated 4th March 1836, to Superintendent of Canals, requesting him to expedite the excavation of the Entally Canal,
Ditto ditto, ditto.	No. 356½. Extract of Minutes recorded this day on the Paper marked No. 356, and its enclosures, by the Members of the Military Board, ..

No. 361. Letter from Superintending Engineer, L. P., dated 30th August 1836, to Secretary to Military Board, transmitting the Paper marked No. 361a,	Military Board's Proceedings, 12th March 1836, No. 19.
No. 390 $\frac{1}{4}$. Memorandum respecting the rates of Toll formerly levied, ..	Ditto 29th March 1837, No. 85.
No. 390 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 7th February 1837, to Secretary to Military Board, transmitting a statement of the Tolls collected on the Circular Canal, &c. during the month of January last, with a Table of Rates,	Ditto ditto, ditto.
No. 394 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 11th March 1837, to Superintending Engineer, L. P., respecting the state of the Sunderbund Tow-paths,	Ditto ditto, ditto.
No. 402b. Letter from Superintendent of Canals, dated 19th September 1836, to Superintending Engineer, L. P., in continuation of his Letter of the 29th August 1836,	Ditto ditto, ditto.
No. 418 $\frac{1}{2}$. Letter from Superintending Engineer, L. P., dated 5th May 1837, to Secretary to Military Board, transmitting the Paper marked No. 418 $\frac{1}{2}$,	Ditto 16th June 1837, No. 37.
No. 418 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 12th April 1837, to Superintending Engineer, L. P., transmitting Plans and Sections of the Gobra Khal, with his observations thereon, ..	Ditto ditto, ditto.
No. 418 $\frac{3}{4}$. Letter from Secretary to Military Board, dated 16th June 1837, to Superintending Engineer, L. P., replying to his Letter marked No. 418 $\frac{1}{2}$, respecting the damming up the Gobra Khal,	Ditto ditto, ditto.
No. 449a. Abstract showing the Total expence connected with dredging the Calcutta Canals, from 1st May 1834 to 1st May 1837, ..	
No. 563 $\frac{1}{2}$. Letter from Captain A. H. E. Boileau, Superintendent of Canals, dated 9th September 1839, to Major DeBude, upon the subject of renting the Ground of the Balliaghatta Docks, ..	

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No. I. Extract Military Board's Annual Report, on the Calcutta and Soondurbun Canals, dated 29th January 1833,	i
No. II. Ditto dated the 25th February, 1834.	ii
No. III. Ditto, ditto, the 13th March, 1835,	iii
No. IV. Ditto ditto, the 3rd May, 1836,	iv to v
No. V. Ditto ditto, the 2nd May, 1837,	v to vii
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No. VIII. Ditto ditto, the 8th September, 1840,	xi to xiii
No. IX. Ditto ditto, the 30th April, 1841,	xiii & xiv
No. X. Ditto ditto, the 31st December [? 2nd May,] 1842,	xv
No. XI. Ditto ditto, 1842-43,	Ibid
No. XII. Ditto ditto, 1843-44,	xvi
No. XIII. Ditto ditto, 1844-45,	Ibid.



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*Supplemental Papers relative to the Calcutta Canals, received from the
Office of the Secretary to Government, Revenue Department.*

	PAGE.
<p>No. I. Letter from the Sudder Board of Revenue, dated 14th April 1829, to the Governor General in Council, transmitting the Paper marked, No. 1, a. and stating, with reference to the Orders of Government of the 29th November 1827, addressed to the late Presidency Board, directing, that the Acting Commissioner in the Soondurbuns should depute proper persons to measure and value the ground at Baminghatta required for the Eastern Canal; that they see no reason to object to the valuation stated in the three Statements annexed, of the estimated value of lands and trees, including compensation for the removal of huts, amounting to Rupees 10,771 : 10 : 8, and requesting authority for the Commissioner to disburse that amount. . .</p>	<p>Territorial Department Consultation, No. 1, 5th May 1829,</p>
<p>No. I. a. Letter from W. Dampier, Esq. Commissioner of the Soondurbuns, dated 31st January 1829, to the Secretary to the Sudder Board of Revenue, returning the Statement referred to as corrected, and stating, that he can only account for the Lakheraj Lands bearing so low a price in comparison with other Lands, from the circumstance of their unproductiveness, and stating, that not one complaint has been made relative to the lowness of the valuation of the Lands taken for the Eastern Canal.</p>	<p>Ditto ditto, ditto.</p>
<p>No. II. Letter from Deputy Secretary to Government, dated 5th May 1839, to Sudder Board of Revenue, requesting them to direct the Commissioner of Soondurbuns to make further inquiry on the subject of compensations payable for Lands taken for the Eastern Canal. Malgoozaree Land not to be purchased, but deductions from the Sudder Jumma to be granted, and a distinct compensation to be made for houses, trees, &c. . .</p>	<p>Ditto, ditto. No. 2, ditto.</p>
<p>No. III. Letter from J. Thomason, Esq. Deputy Secretary to the Government, dated 15th May 1832, to W. H. Macnaghten, Esq. Secretary to the Governor General, Revenue Department, transmitting for his Lordship's perusal, the Papers marked No. 88, and No. 89, in Appendix to Appendix II.</p>	<p>Revenue Department Consultation, No. 2, 13th May 1833.</p>

Revenue Department Consultations, No. 3, 13th May 1833.

No. IV. Letter from Secretary to the Governor General, dated 26th June 1832, to J. Thomason, Esq. returning the Papers transmitted in his Letter of the 15th ultimo, and stating, that the Governor General observes, that the observations of Captain Jenkins, relative to the state of the new Soondurbun and Intally Canals, will remain for future consideration ; in the meantime, the remarks contained in the 10th Paragraph of that Officer's report seems to His Lordship to merit attention.

Ditto ditto, No. ditto.

No. V. Letter from J. Thomason, Esq. Deputy Secretary to Government, dated 10th July 1832, to Sudder Board of Revenue, directing their attention to an Extract, Paragraph 10, of a Letter dated 16th April last, addressed by Captain F. Jenkins to the Military Board, and requesting a report as to what stipulations have been made with the Grantees of Waste Lands in the Soondurbuns, to secure the right of tracking on the river face of their Grants.

Ditto ditto, No. 5, ditto.

No. VI. Letter from Secretary to the Sudder Board of Revenue, dated 3rd May 1833, to Secretary to Government, Revenue Department, with reference to the Deputy Secretary Mr. Thomason's Letter of the 10th July 1832, transmits the Paper marked No. VI. a.

Ditto ditto, No. 6, ditto.

No. VI. a. Letter from W. Dampier, Esq. Commissioner of the Soondurbuns, dated 22nd April 1833, to Secretary to the Sudder Board of Revenue, in reply to his Letter of the 16th instant, states, that no stipulations have been made with the Soondurbun Grantees as to the right of travelling and tracking ground on the river face of their several Grants, nor is he inclined to think such stipulation would be of any use, as the whole of the Canal route is through rapid Tide-ways, and the Boats by quitting at particular times the anchoring places, manage easily to reach the several points where the Tide changes, so as to take advantage of each Tide until they pass through the Jungle ; that any new stipulation with the Grantees would discourage them ; that laden Boats are seldom to be found tracking in the Tide-ways, as they find it better to wait for the flow or ebb as they require to move, than to exhaust their crews in tracking against the stream ; that if the tracts of Grounds between the River and the Bunds formed by the Grantees were cleared of Jungle, the Bunds would be exposed to constant encroachment from the River ; that the great danger of the Soondurbun passages is from stumps of trees which project from the bank of the Jungle Lands, and against which Boats are frequently forced by a sudden gust of wind or eddy of the Tide ; and that as the clearings go on, this evil will entirely cease to exist.

- No. VII. Letter from Secretary to the Sudder Board of Revenue, dated 1st April 1834, to Deputy Secretary to Government of Bengal, transmitting with reference to Mr. Secretary Macsween's Letter No. 1004, dated 24th September 1834, the Papers marked No. VII. a. to No. VII. b.⁽¹⁾ inclusive with observations thereon. Revenue Department Proceedings, 1st November 1836, No. 4.
- No. VII. a. Minute by W. W. Bird, Esq. Member of the Sudder Board of Revenue, dated 29th January 1834, relative to regulating the Tolls of the Balliaghatta and Circular Canal, and transmitting the Paper marked No. VII. a.⁽¹⁾ Ditto ditto, No. 5.
- No. VII. a.⁽¹⁾ Draft of a Regulation for modifying Regulation VII of 1810, and for Collecting a Toll on Boats passing through the Balliaghatta and Circular Canals. Ditto ditto, ditto.
- No. VII. b. Minute by J. Pattle, Esq., dated 27th February 1834, relative to regulating the Tolls of the Balliaghatta and Circular Canal and Tolley's Nullah, and transmitting the Paper marked No. VII. b.⁽¹⁾ Ditto ditto, No. 6.
- No. VII. b.⁽¹⁾ Draft of a Regulation for rescinding Regulation VII of 1810, and for collecting a Toll on Boats passing through the Balliaghatta and Circular Canals and Tolley's Nullah. .. Ditto ditto, ditto.
- No. VIII. Letter from Secretary to Sudder Board of Revenue, dated 8th August 1834, to Secretary to Government in the Revenue Department, transmitting a Letter from the Secretary to the Military Board, (entered in Index to Appendix to Appendix H, as No. 195,) dated 25th July, with its enclosure from Captain Thomson, regarding the expense which is incurred in repairing the Road through which the Firewood dealers carry their wood to avoid the payment of Tolls, and begging that it may be taken into consideration, with the Board's Letter of the 1st April regarding the Canal. Ditto ditto, ditto.
- No. IX. Letter from Secretary to Sudder Board of Revenue, dated 23rd December 1834, to Secretary to Government in the Revenue Department, in continuation of Mr. Bushby's Letter of the 8th August, submits further communications from the Commissioner of Allopore Division, dated 3rd September 1834, with its enclosures* respecting the importation of Firewood by Land, &c., and requests early orders on the Board's Letter of 1st April respecting Draft of a Regulation for Regulating Tolls in the Circular Canal. Ditto ditto, No. 7.

* Revenue Department Proceedings, 1st November 1836, No. 10. Letter from Hindoostanee Merchants of Calcutta, dated 12th February 1835, stating, that when Boats are obliged to come down by Banderkhawl or Soonderbund Canal, the Toll Officers stationed at Allopore Ghaut charge a duty of 2 Rs. per 100 maund on Merchandise Boats, while the rate of only one Rupee is levied on such Boats passing through the Jellinghee and other Rivers, and begging that the enhanced rate of Toll may be reduced.

Revenue Department Proceedings, 1st November 1836, No. 11. Letter from Shaik Lall Mahamod, dated 1st November 1836, to Secretary to Government, Judicial Department, offering to farm the Lease of the Tolls at Gurreeh-haut, Tollygunge, &c. at Sa. Rs. 800 per annum, and proposes to give substantial security for the due fulfilment of his engagement in the event of his offer being accepted.

Revenue Department Proceedings,
1st November
1836, No. 16.

No. X. Letter from Secretary to Sudder Board of Revenue, dated 7th March 1836, to the Secretary to the Government of Bengal, in the Revenue Department, with reference to the Paragraph 2d of his Letter of the 2nd ultimo, suggests, that supervision of the Toll of Tolley's Nullah and Canals within the Collectorate of Calcutta be placed under Captain Thomson, the Superintendent of Canals, and calls attention to the Board's proposition for their improved management, to which they request a reply. .

Ditto ditto, No. 18.

No. XI. Letter from Superintendent of Canals, dated 12th May 1836, to Secretary to Government of Bengal, stating, that the Tolls collected at the Mouth of Tolley's Nullah between the River Hoogly and Kidderpore Bridge in the year 1835, amounted to Rupees 475.

Ditto ditto, No. 19.

No. XII. Letter from Secretary to Government of Bengal, dated 7th June 1836, to Secretary to Legislative Council, transmitting by the

Letter from the Military Board, dated 10th September 1833, with two Enclosures.

Letters to ditto and to Acting Secretary Sudder Board of Revenue, dated 24th September 1833.

From Military Board, 11th February 1834, and one Estimate.

From Acting Secretary Sudder Board of Revenue, dated 1st April 1834, and one Enclosure.

From ditto, 8th August 1834, Enclosure missing.

From ditto, 23rd December 1834, and two Enclosures.

From Military Board, 12th September 1834.

To ditto, 29th September 1834.

To ditto, 31st March 1835.

From ditto, 27th October and one Enclosure.

To ditto, 17th November and one Enclosure.

From ditto, 29th April 1836.

From Superintendent of Canals, 12th May 1836.

From Secretary to the Government of India, 6th April 1835.

To Military Board, 12th May 1835.

From ditto, 18th September, and two Enclosures.

From ditto, 20th January 1835, and one Enclosure.

To ditto, 6th February 1835.

From Secretary Sudder Board, 18th January 1836, with one Enclosure.

To ditto, 2nd February 1836, with one Enclosure.

From ditto, 7th March 1836, with one Enclosure.

From Military Board, 23rd January 1835, with an Estimate.

From ditto, 3rd March, with two Estimates.

Two Petitions of Natives.

desire of the Governor of Bengal, the Papers noted on the margin relative to the Eastern Bytuckhannah and Circular Canals, with the accompanying Draft of a Proposed Act for the future regulation and management of those lines of the Navigation, and requesting, that they may be laid before the Governor General of India in Council, and stating, that His Lordship's deliberations upon the subjects of the Papers transmitted have been assisted by the Committee of Officers whose names are entered on the margin,* and stating the conclusions arrived at. . . .

* Mr. Pattle, Mr. McFarlan, Colonel Cragie, Major Irvine, Captain Thomson, and Mr. Mangles.

Ditto ditto, No. 20.

No. XII. a. Draft of a Proposed Act for the future regulation and management of Eastern Bytuckhannah and Circular Canals. . .

Ditto ditto, No. 21.

No. XIII. Letter from Secretary to the Government of India, dated 27th June 1836, to the Secretary to the Government of Bengal, in reply to his Letter of the 7th instant, states, that the Act referred to in his Letter, has been published for general information in an amended form, and returns the Papers transmitted with his communication.

No. XIV. Letter from Secretary to Government of Bengal, to Secretary of the Sudder Board of Revenue, dated 9th July 1836, requesting the Board's sentiments on the Draft of the Proposed Canal Act, published in the Calcutta Gazette of the 6th instant, either as regards its principles or its details, or both.

No. XV. Letter from Secretary to Sudder Board of Revenue, dated 1st August 1836, to Secretary to Government of Bengal, in reply to his Letter of the 9th ultimo, transmits the Paper marked No. XV, a., and states that the Junior Member has been prevented from adding his opinion on the above Act, owing to his not having been furnished with the Papers connected with the Act till too late to make use of them.

Ditto ditto, No. 27.

No. XV. a. Original Minute of the Senior Member of the Sudder Board of Revenue, on the subject of the Proposed Act regarding the Canal Tolls.

Ditto ditto, ditto.

No. XVI. Letter from Secretary to Government of Bengal, dated 9th August 1836, to Secretary to Sudder Board of Revenue, acknowledging the receipt of his Letter of the 1st instant with its Enclosure, and directing that the Junior Member of the Board, Mr. Smith, may be requested to state his sentiments on the Canal Enactment under discussion.

Ditto ditto, No. 29.

No. XVII. Letter from Secretary to Sudder Board of Revenue, dated 3rd September 1836, to Secretary to Government of Bengal, transmitting in original, the Paper marked No. XVII, a.

Ditto ditto, No. 30.

No. XVII. a. Minute by C. W. Smith, Esq. Junior Member of the Sudder Board of Revenue, on the principles and details contained in the Proposed Canal Act, and Establishment of one uniform rate of Toll.

Ditto ditto, ditto.

No. XVIII. Letter from Secretary to Government of Bengal, dated 6th September 1836, to the Secretary to the Government of India, in the Legislative Department, in reply to his Letter of the 27th June last, transmits a Draft of the Proposed Act in an amended

Ditto ditto, No. 31.

Letter from Secretary to the Sudder Board of Revenue, dated 1st August, with Mr. Pattle's Minute.

Ditto ditto, dated 3rd September, with Mr. Smith's Minute.

Ditto, from Military Board, dated 29th July, with Enclosure from Mr. James Prinsep.

form, for the future regulation and management of the Circular and Eastern Canals, for the purpose of being laid before the Supreme Government, together with the Papers noted on the margin.

No. XIX. Letter from Secretary to Government of India, dated 26th September 1836, to Secretary to Government of Bengal, in reply to his Letter of the 6th instant, transmits a Copy of the Act marked No. XIX, a. passed this day into Law, and published for general information.

Ditto ditto, No. 32.

Revenue Department Proceedings, 1st November 1836, No. 33.	No. XIX. <i>a.</i> Act No. XXII, of 1836, for regulating Tolls in the Calcutta Canal, passed by the Right Honorable the Governor of India in Council. on the 26th September 1836.
Ditto ditto, No. 43.	No. XX. Rules passed by the Right Honorable the Governor of Bengal, under Act No. XXII, of 1836, published, as required by Section VII of that Act, for general information.
	No. XXI. Rules for the supervision and preservation of the Navigation of the Canals, specified in Act No. XXII, of 1836.
Ditto ditto, No. 46.	No. XXII. Letter from Secretary to the Government of Bengal, dated 1st November 1836, to the Secretary to the Sudder Board of Revenue, transmitting Paragraph 3rd of a Letter addressed by the Canal Committee on the 26th ultimo to Government, with orders to introduce a clause of the nature therein recommended in all future Soondurbun Grants, apprizing the Board at the same time, that the general Fiscal as well as Conservative Superintendence of the lines of Canal specified in Act No. XXII, of the present year, has been transferred to the Military Board.
Ditto 7th March 1837, No. 11.	No. XXIII. Letter from Secretary to Government, dated 20th December 1836, to the General Management of the Bengal Military Orphan Society, requesting them to state the precise extent to which the increase of Toll in Tolley's Nullah has injured the proceeds of the Orphan Gunge or Bazar.
Ditto ditto, No. 15.	No. XXIV. Letter from Secretary to Government, dated 7th March 1837, to the Secretary to the Orphan Society, stating, that the Regulation imposing an indiscriminate rate of Toll on Tolley's Nullah cannot be dispensed with in favour of that Society; and in regard to the diminished traffic of the Society's Bazar, refers them to a copy of the Superintendent of Canal's Report of the 5th January last.
Ditto ditto, No. 19.	No. XXV. Letter from Secretary to Government, dated 7th March 1837, to certain Traders frequenting Tolley's Nullah, stating in reply to their Petitions of the 28th December last, the inability of Government to grant the relief they solicit relative to the reduction in the rate of Toll in Tolley's Nullah, and stating, that measures will be shortly taken to deepen and improve the Navigation of the Canals.
Ditto 1st May 1838, No. 3.	No. XXVI. Letter from C Thackeray, Esq., dated 4th October 1837, to Secretary to Government of Bengal, respecting a Petition from certain Merchants and Traders, praying for a more equal adjustment of the Tolls on Tolley's Nullah, and begging that no final determination may be come to on that point without his being heard thereupon.

<p>No. XXVII. Letter from Secretary to Government of Bengal, dated 5th October 1837, to C. Thackeray, Esq. in reply to his communications of the 4th instant, states, that the Petition to which he refers has been sent to the Military Board for Report, and should any future communication with the Petitioners appear necessary, they will be duly informed to that effect. . . .</p>	<p>Revenue Department Proceedings, at May 1838, No 4.</p>
<p>No. XXVIII. Letter from C. Thackeray, Esq., dated 28th November 1837, to Deputy Governor of Bengal, submitting his observations on the Report of the Military Board, upon the Petition of certain Merchants and Traders, complaining of the present mode of collecting the Tolls on Tolley's Nullah, which operates very grievously on them as Importers of Firewood. . . .</p>	<p>Ditto ditto, No. 10.</p>
<p>No. XXIX. Letter from Secretary to Government of Bengal, dated 1st May 1838, to C. Thackeray, Esq., transmitting a Copy of the Resolution passed by His Honor the Deputy Governor on the 24th ultimo, reducing the rates of Tollage on the Calcutta Canals.</p>	<p>Ditto ditto, No. 24.</p>
<p>No. XXX. Letter from Secretary to the Sudder Board of Revenue, dated 5th June 1838, to Secretary to Government of Bengal, transmitting the Papers marked No. XXX, a. and No. XXX, b. prepared by the Accountant Revenue Department, shewing the results of the management of Tolls in Canals in the Lower Provinces for 1835-36.</p>	<p>Ditto 26th June 1838, No. 3.</p>
<p>No. XXX. a. Annual General Report of Gross Collections and Expenses and Net Collections, on account of Tolls at certain Canals. . .</p>	<p>Ditto ditto, ditto.</p>
<p>No. XXX. b. Annual Comparative General Report of Gross Collections on account of Tolls at certain Canals, for 1835-36, compared with 1834-35.</p>	<p>Ditto ditto, ditto.</p>
<p>No. XXXI. Extract Proceedings of the Honorable the President in Council, in the Military Department, under date the 24th December 1838, containing the notification of the appointment of Lieutenant A. H. E. Boileau, Engineers, to be Agent for Suspension Bridges and Superintendent of the Circular and Eastern Canals, vice Captain J. Thomson.</p>	<p>Ditto 15th January 1839, No. 1.</p>
<p>No. XXXII. Letter from Secretary to Government of Bengal, dated 4th June 1839, to the Accountant General, informing him, that the Military Board have been instructed to carry into effect the mode of paying into the 24-Pergunnahs' Treasury, the Canal Collections in the vicinity of Kidderpore.</p>	<p>Ditto 4th June 1839, No. 13.</p>
<p><i>Extract Proceedings of the Honorable the Deputy Governor of Bengal in the General Department, under date 17th October 1838, containing the Papers marked No. XXXIII, to No. XXXIII, b., inclusive.</i></p>	<p>Ditto 11th July 1839, No. 16.</p>

Revenue Department Proceedings, 11th July 1839. No. 16.	No. XXXIII. Letter from the Board of Customs, Salt and Opium, dated 10th October 1838, to the Deputy Governor of Bengal, transmitting the Papers maked No. XXXIII, <i>a.</i> to No. XXXIII, <i>a.</i> ^(1b) inclusive, relative to exempting Mr. G. Prinsep's Boat, conveying Fuel for the use of the Salt Manufacture at Balliaghat Salt Works, from payment of Toll.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> Letter from the Salt Agent of the 24-Pergunnahs, dated 20th August 1838, to Secretary to the Board of Customs, Salt and Opium, transmitting with observations, the Papers marked No. XXXIII, <i>a.</i> ⁽¹⁾ to No. XXXIII, <i>a.</i> ^(1b) relative to the Superintendent of Canal's refusal to allow Mr. Prinsep exemption from the payment of Toll Duties upon his Fuel Boats. ..
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ⁽¹⁾ Letter from G. Prinsep, Esq., dated 28th July 1838, to the Salt Agent of the 24-Pergunnahs, transmitting with observations, the Papers marked No. XXXIII, <i>a.</i> ^(1a) and No. XXXIII, <i>a.</i> ^(1b) on the subject of (his) Mr. Prinsep's claim to exemption from Toll on all Firewood brought to his Balliaghatta Salt Works.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ^(1a) Copy of a Letter, dated 14th July 1838, from G. Prinsep, Esq. to the Superintendent of Canals, complaining that the Firewood consumed at the Balliaghatta Salt Works during the past season has been charged with the Canal Toll, which is opposed to the Government order in his favor, exempting Boats supplying his Salt Works with Fuel from Toll.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ^(1b) Letter from Superintendent of Canals, dated 16th July 1838, to G. Prinsep, Esq. stating, that the Regulation of 1st November 1836, cancelled all former orders respecting exemption, as has been decided in the case of Boats with Troops, Treasure or Stores on Board.
Ditto ditto, ditto.	No. XXXIII. <i>b.</i> Ordered that a Copy of the foregoing Letter from the Board of Customs, Salt and Opium, and its Enclosures, be sent to the Revenue Department, in order that the Superintendent of Canals may be instructed to grant certificates to Mr. Prinsep's Boats conveying Fuel to his Salt Works.

Abstract of Despatches from the Government of India to the Honourable Court of Directors, relative to the subject of the Calcutta Canals and the Canal to Channel Creek.

PAGE.

No. XXXIV. Extract of a Letter, dated the 15th December 1804, Revenue Department, to the Honourable the Court of Directors, transmitting the Papers noted on the margin, relative to the expiration on the 4th July last, of the Lease, granted to the widow of the late Colonel Tolley, of the Tolls on Tolley's Nullah and of its having been placed under the charge of the Board of Revenue, who have been directed to report on a new rate of Tolls, and on improving the Navigation of the Nullah.

{ Miscellaneous,
" 31st May 1804,
" 12th July 1804,
" 19th July 1804,
{ Cons.,
" 10th Jan. 1805,
" 15th Aug. 1805,
" 19th & 26th Sept. 1805,
" 17th Oct. 1805,
" 21st & 29th Nov. 1805,
" 13th & 19th Dec. 1805,
{ Cons.,
" 25th Oct. 1804,
" 12th Nov. 1804.

No. XXXV. Ditto, dated the 15th May 1806, Revenue Department, to ditto, stating, that the Vice-President in Council had on the Reports furnished by the Board of Revenue, resolved on certain excavations being made for improving the Navigation of Tolley's Nullah, and transmitting the Papers noted on the margin.

{ Cons.,
" 15th May 1806,
" 13th Dec. 1805,
{ Miscellaneous,
" 29th Nov. 1805,
" 15th May 1806,
" 8th May 1806,

No. XXXVI. Ditto, dated the 30th July 1823, to ditto, referring to the 215th and following Paragraphs of the Despatch of the Government of India, dated the 30th July 1823, bringing to the Honourable Court's notice the Memoir submitted by Lieut. Schaleh, explanatory of a Plan for opening a Canal communication between the River Hoogly and the Ganges—state, that the present condition of the Government Finances is not only favourable to the completion of the above work, but an application of a portion of those Finances to public purposes is essential to the reputation of the Honourable Company; that a net receipt of Rupees 52,500 per annum from the Canal in question will bear Government harmless, and that there appears no cause to doubt that a more favourable result may not be realized—and mention, that they had received a communication from Mr. Wood, forwarding Plans and Estimates of a proposed Cut from Calcutta to Channel Creek, which they had referred to the Canal Committee, who referred them to Lieut. Schaleh, (who had formed a similar Plan to that of Mr. Wood's.) on the receipt of whose reply they gave the preference to Lieut. Schaleh's Plan, which the Government have sanctioned to be carried into effect at a cost not exceeding 5,06,217, and remark on the employment of a Steam Dredger.

No. XXXVII. Ditto, dated the 29th June 1826, to ditto, referring to the 8th Paragraph of their Financial Letter, dated the 31st December 1824, report on the progress made in the construction of the Eastern Canals and the Canal to Channel Creek, Diamond Harbour, and the Iron Suspension Bridges.

No. XXXVIII. Extract of a Letter, dated the 26th June 1828, to the Honourable Court of Directors, referring to the 147th and the following Paragraphs of Despatch of Bengal Government, dated the 29th June 1826, reporting the progress of the works under the Canal Committee's charge, state, what has been done in respect to the construction of Bridges and Canals subsequent to 1824, and the cost of constructing the Tide Way through the Salt Water Lake, and the purchase of ground for the Circular Canal.

No. XXXIX. Ditto, dated 23rd November 1830, to ditto, stating, that the information required by the Honourable the Court of Directors in their Despatch of the 10th September 1828, respecting the progress made in the several Canal Works from 1824 to 1826, has already been communicated in the Despatch of the Bengal Government of the 26th June 1828, and communicating the progress made during the year 1827.

No. XL. Ditto, dated the 21st December 1830, to ditto, stating, that having no detailed information to submit with reference to any Despatch from the Honourable Court, they submit a review of the progress made in the several Canal Works during the years 1828 to 1830.

No. XLI. Ditto, dated the 27th October 1831, to ditto, being a continuation of the Despatch of the Government of Bengal, dated the 21st December 1830.

No. XLII. Ditto, dated the 6th December 1831, to ditto, on the subject of Ferry Boats in the Eastern Canals and Colonel Tickell's and Mr. James Prinsep's Reports on the advantages to be derived from the Circular and Eastern Canals, &c.

No. XLIII. Ditto, dated the 24th July 1832, to ditto, referring to the 13th Paragraph of the Mis. Rev. Despatch of the 16th August 1831, explain the cause of the great decrease in the gross receipts in 1829 and 1830, of Tolls levied in Tolley's Nullah and Balliaghatta Canal, which arose from the general falling off of Trade and the failure of the principal Agency Houses in Calcutta, and state, that the tenders for Farming the Canal Tolls have not been sufficiently favourable to warrant their being accepted.

No. XLIV. Ditto, dated the 26th July 1832, to ditto, in continuation of Paragraph 7th of the Despatch of the Government of India of the 6th December 1831, relative to the admission of Boats into the new Circular Canal, on payment for the present of a duty equal to 50 per cent. over and above the duty levied on Boats entering the Intally Canal.

No. XLV. Extract of a Letter, dated the 17th February 1834, relative to Mr. Prinsep's Report on the Canal operations during 1830, 1831 and 1832, and his suggestion for a modification in the Locks at Chitpore, and clearing out the Intally Canal. ..

No. XLVI. Ditto, dated the 28th June 1836, to ditto, stating that in the several Despatches from the Government of India specified on the margin, the Proceedings of the late Government up to the 10th November 1834, on subjects of Miscellaneous nature, were reported, and that the present Despatch narrates the Proceedings of the late Governour, Lord William Bentinck, and of the Honourable Sir Charles Metcalfe, on the same description of subject, up to the close of the year 1835, and transmitting Papers, relative to the degree of benefit which had been derived from the Circular Canal and from the consolidation of Tolls...

Narrative of the Miscellaneous Rev. Proceedings from 11th Nov. 1834, to 31st December 1836

No. XLVII. Ditto, dated the 29th November 1836, to ditto, relative to the Iron Bridge Department, &c.

No. XLVIII. Ditto, dated the 19th September 1837, relative to the Eastern Boitakanah and Circular Canals, and the subsidiary arrangements made under the Provision of Act No. XXII, of 1836, on the Regulation and management of those lines of Navigation.

No. XLIX. Ditto, dated the 28th April 1838, to ditto, replying to the Court's Letter No. 2, of 1807, on the subject of the Eastern and Circular Canals in respect to the fitness of the Chitpore Locks for the object of its construction. the means employed to remove the silt deposited in the Canal by the Calcutta Drains, the average number of Boats which pass the Canal daily, and the number which can pass in a day ; and what effect the mingling of the water of the Lake has had on the water of the River Hoogly.

No. L. Ditto, dated the 2nd June 1838, to ditto, relative to Captain Thompson's, Superintendent of Canals, Annual Report on the state of the Canals under his charge.

No. LI. Ditto, dated the 2nd July 1838, to ditto, with reference to the Despatch of the Bengal Government of the 2nd June last, state, that they have sanctioned the damming up of the Kowrah Pookreah Khal.

No. LII. Ditto, dated the 15th September 1838, to ditto, relative to illegal encroachments on Canal Lands.

No. LIII. Ditto, dated the 28th January 1839, to ditto, relative to the Tolls on Tolley's Nullah.

- No. LIV. Extract of a Letter, dated the 11th April 1839, to the Honourable the Court of Directors, relative to the expediency of permitting Government Boats to pass free of Tollage through the Public Canals.
- No. LV. Ditto, dated 5th September 1839, to ditto, relative to an Estimate for clearing out the Dhurrantollah Cess Pool... ..
- No. LVI. Ditto, dated the 9th September 1839, to ditto, relative to the construction of a Dredging Boat.
- No. LVII. Ditto, dated the 26th December 1839, to ditto, relative to arrangements made for paying the Toll Collections realized in the vicinity of the Kidderpore Bridge to the Treasury of the 24-Pergunnah Collectorate; and those realized nearer the Presidency, to the General Treasury.

Rev. General Letter No. 11, of 8th June 1840, Roads, Bridges and Canals, Mis. Rev. Proc, 22nd Oct. 1839, Nos. 1 and 2.

- No. LVIII. Extract of a Despatch, dated 5th June 1840, No. 11, Paragraph 2, from the Government of Bengal, to the Honourable Court of Directors, transmitting the Papers noted on the margin, and stating, that they had complied with the Military Board's application for an extra establishment, in the Collecting Department, being allowed to the Superintendent of Canals.

Ibid, No. 14, of 9th July 1840, Tolls. Mis. Rev. Proc. 19th September 1839, No. 9 to 11, and No. 15, 28th November 1839, Nos. 3 & 4, 30th Jan. 1840, Nos. 4 and 5.

- No. LIX. Ditto, dated 9th July 1840, No. 14, Para. 6, from ditto to ditto, transmitting the Papers noted on the margin, and stating, that among them will be found a Report on the Toll Collections of the Calcutta Canals under Act No. XXII, of 1836, during the half year ending 30th April 1839, which (including the Report submitted with Mr. Robertson's Despatch No. 12, dated 5th September 1839,) completes the whole year's receipt upon the reduced rate of Tollage brought in force under Orders of the 24th April 1838, as reported to the Honourable Court in Para. 42, of Colonel Morison's Despatch, No. 1, dated 28th January 1839, and that the satisfactory result noticed in the above Papers is to be attributed to the discharge of 2 dishonest Toll Dorogahs, and to the zeal and fidelity of those at Chitpore, Kidderpore and Pauspotah; to the removal of the Toll House a mile Westward from the head of the Lake Channel; to the discontinuance of the practice of employing unpaid Agency in receiving from the Toll Dorogahs, Collections for deposit in the General Treasury; and to the introduction of an improved method of ascertaining the Tonnage of Boats; and, with reference to the question discussed by the Military Board of Farming out the Tolls, no final orders have been passed upon the subject pending the receipt of the details of that Plan on which that measure was recommended.

	PAGE.
No. I.X. Extract—Revenue General Letter, dated 29th October 1840, No. 21, Paragraph 2, from the Government of Bengal to the Hon'ble Court of Directors, stating that they had sanctioned at a cost of Rupees 4,528:10:6, the excavation of the deposit in the Entallee Canal, and remarking on Captain Boileau, Superintendent of Canals, having brought on his Cash Account the fines levied under the Canal rules,	Mis. Rev. Proc. 14th April 1840, Nos. 1 and 2.
No. I.XI. Ditto, dated 13th March 1841, No. 4, Paras. 10 to 13, to ditto, transmitting the Papers noted on the margin, relative to the operations on the Calcutta Canals for the half-year ending 30th April 1840, and stating, that the results are highly satisfactory in a financial point of view, the amount of Tolls collected being 76,849:4:9 in excess of the first six months of the collections of 1837-38 and in 1838-39, which favourable results are to be ascribed to the active and judicious management of Captain Boileau,	Ditto, 21st July 1840, Nos. 4 to 6.
No. I.XII. Ditto, dated 23rd March 1841, No. 6, Paras. 6 to 12, to ditto, transmitting the Papers noted on the margin, relative to the detention by the Superintendent of Canals of certain Company's Paper held as Security for the good conduct of one of the Toll Collectors, since detected in embezzling, and to an application by the Superintendent of Canals for remuneration as Collector of Tolls, and to certain rewards granted to the Toll Darogahs,	Ditto, 10th No- vember 1840, Nos. 4 to 8.
No. I.XIII. Ditto, dated 2nd June 1841, No. 13, Para. 7, transmitting the Papers noted on the margin, referring to the appointment of the Superintendent of Canals as a Magistrate of the Circular and Eastern Canals,	Ditto, 26th Janu- ary 1841, No. 2.
No. I.XIV. Ditto, dated 2nd June 1841, No. 13, Para. 15, with reference to Despatch No. 6, dated 23rd of March last, transmits the Papers noted on the margin, and states, that the Supreme Court have nonsuited the action brought against the Superintendent of Canals for the detention of certain Company's Papers deposited by one of the Toll Collectors as security, ..	Ditto, 23rd of March 1841, No. 1.
No. L.XV. Ditto, dated 18th October, No. 27, Paras. 11 to 13, to ditto, transmitting the Papers noted on the margin, exhibiting the gross Collections, Charges and net Collection of Tolls on the Calcutta Canals, for the years 1838-39 and 1839-40,	Ditto, 20th of April 1841, Nos. 3 to 8.
No. L.XVI. Ditto, dated 16th May 1842, Judicial General Letter, No. 13, Paras. 9 and 10, to ditto, transmitting the Papers noted on the margin, and stating, that they exhibit a very satisfactory account of the Toll Collections on the Calcutta Canals,	Rev. Proc. 25th January 1842, Nos. 37 and 38.

Rev. Proc. 5th
Feb. 1844, Nos. 33
to 35.
Ditto, 4th March.

No. LXVII. Extract—Revenue General Letter, dated 6th July 1844, Judicial General Letter, No. 14, Paras. 19 and 20, to ditto, transmitting the Papers noted on the margin, containing a half-yearly Report ending 31st October 1843, on the Toll Collections of the Calcutta Canals, showing a decrease of 3,651 Rupees in the amount realized, compared with the corresponding period of the preceding year; and stating that the grounds of the Military Board's objection to Farming* the Collections are, that, if the Toll Collections were entrusted to private agency, a wide field would be opened for imposition, exaction, and oppression, on the poorer classes of the trading community,

* See No. LIX.

No. LXVIII. Extract of a Letter from the Honorable the Court of Directors to the Governor General in Council, in the Revenue Department, dated 9th March 1831, No. 8, respecting the proceedings of the Saugor Island Society, and the proposed Canal to Saugor, upon which Canal the Court request an early communication of the Government's sentiments,

xx.

No. LXIX. Extract of a Letter from the Honorable Court of Directors to the Government of Bengal, in the Revenue Department, dated 25th September 1835, No. 6, respecting the Saugor Island Society's operations upon Saugor Island, and expressing their regret that the repeated efforts of the Government to induce the mercantile community to open a water communication between Calcutta and the lower Soondurbuns, were unsuccessful, ..

Ibid.

No. LXX. Letter from James Morris, Esq., dated 25th July 1845, to C. Beadon, Esq., Under-Secretary to Government of Bengal, requesting to be furnished with extracts from certain Dispatches of the Government of Bengal to the Honorable Court of Directors,

xxi.

The following Papers omitted to be inserted at pages, ix. x. and xi. of this Index.

No. XXXV½. Extract of a Letter from the Government of India, dated 1st August 1822, Paras. 215 to 225, to the Honorable Court of Directors, transmitting Lieut. Schalech's Memoir, explanatory of a plan for opening a permanent communication between the River Hooghly and the Ganges, and stating, that before coming to any decision on the plan, they have referred it to a Committee to report upon it.

Consultation 28th
July 1821, Nos. 6
and 7, 10th August,
Nos. 10 and 11, 21st
Ditto, Nos. 34 and
35, 23rd November,
No. 10.

No. XXXV½. Ditto, dated 19th June 1823, Para. Nos. 11 to 13, to ditto, referring to the intention of the Government to apply the Town Duty Collections to purposes of Local Improvements, and stating, that they do not doubt that the Honorable Court will cor-

dially feel the obligation, which the very possession of a large surplus appears to imply, of employing a part in measures calculated to raise the moral condition of the people ; to add to the comforts of the Community ; to enlarge the sources of wealth ; to facilitate Commercial intercourse ; and to correct the physical disadvantages of the country ; and remarking, that the expence incurred in the construction of Public works, if judiciously applied, can scarcely indeed be considered as a charge, as the disbursement will soon be repaid—inasmuch as sums disbursed for such beneficial purposes as above indicated, may be regarded rather as advances made to enhance the value and enlarge the wealth of the country than as the current expences of the Government,

No. XLIII $\frac{1}{2}$. Extract of a Letter from the Governor General in Council, dated the 17th July 1832, No. 5, to ditto, transmitting with observations the Proceedings connected with the Saugor Island Society, and stating that the Government have failed in their repeated attempts to induce the mercantile community to undertake the project for improving the communication between Calcutta and the lower Sundurbuns,

xiv.

No. XLVII $\frac{1}{2}$. Extract of a Letter dated 21st February 1837, No 3, from the Government of Bengal, to the Honorable the Court of Directors, respecting the further Proceedings connected with the Saugor Island Society,

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APPENDIX to APPENDIX (H)

No. 9.

[No. 1 to No. 8 and the other numbers hereafter noticed, as “omitted,” of the Papers of the Index to Appendix to Appendix (H) are not deemed by the Municipal Committee necessary to be Printed.—J. M.]

Minute by Lieutenant-Colonel Galloway on the New Circular and Sunderbun Canal.

I have perused those Papers⁽¹⁾ with much interest and attention—and, however unwilling I must naturally be, to express an opinion opposed to that of those who devised, who have recommended, or who have conducted the very extensive and enormously expensive operation of forcing, by means of Canals, a new communication between the Hooghly, immediately above the Town of Calcutta and the Ganges, by the ⁽²⁾Ishamuttee river, yet I cannot help saying, that to me, the project appears defective in design; to hold out no advantages commensurate at all with the cost of the undertaking; whilst I conceive it to be attended with considerable risk of injury to the Navigation of the Hooghly below Calcutta; and by no means altogether free from danger to a portion of that City.

The object contemplated seems to have been to shorten, and to facilitate, the Navigation of the Sunderbun passage into the great River, so as to obviate the difficulty which now opposes water communication with the Upper Provinces—by reason of the mouths of the Hooghly being shut to large, and even to lighter Craft, for several months of the year. It was therefore incumbent on those who proposed such a work as this, to shew at least, that the progress of Boats through the Sunderbuns, as compared with existing passages, would be expedited—not merely a little, but most essentially, before they could justify their call for such an expenditure of the public resources.—What has been the fact? Instead of Boats passing more expeditiously, we find that by the route of the Canal, compared with the old course in reaching the Ishamuttee, “there is a loss of a whole day for all Boats of a considerable draft of water using oars”—and that even “heavy Boats of burden, supposing them to require two tides instead of one, in reaching Attarabanka, would nevertheless perform the lower and old passage, in the same time as would be taken by the Canal route,” that is in the Canal, on which 13½ lakhs of Rupees have already been spent.—The original Estimate by Captain Schalch for the whole length of Canal was 9 Lakhs—as yet no operations have been carried on beyond the Ishamuttee river; which is not half the extent of line proposed:—another Estimate I perceive amounted to 10,27,350 Rupees—This is the report of Mr. James Prinsep, the present superintendent, who, in his scale of time required for making either passage, states the old route by Tolly’s Nullah to the Ishamuttee to require 22 hours, whilst, by the Canal, the time required is 34 hours; so

(1) Referring to Nos. 128, 130, 131, of App. (H)—J. M.

(2)? Gurry.—J. M.

Mr. Prinsep’s Report. Ibid.

that, instead of expedition, though the distance is shorter, *there is an impediment of 12 hours in 22 created by the New Canal.*

Now the reason of this I will explain; and it is here that the original defect in the project will be made manifest.

The country through which the Canal is cut is intersected by a number of Khals, or streams, many of which are deep and broad, and which, in some parts of the world, would be considered as Rivers; they are all within the influence of a strong Tide. The general direction of these streams is North and South, that of the Canal is East—consequently it intersects those streams.

Suppose then for the sake of illustration, any two of those streams *A, B*, running North be taken, and the Cut of Canal *C*, between them trending East—it is obvious that the Tide setting North in *A*, and in *B*, must meet in the Canal *C*, somewhere about half way, thus⁽¹⁾—so that a boat Eastward bound, and entering the Canal *C* with the Flood Tide making from *A*, will be carried only half way through the Canal, where it will remain in dead water, and its progress be opposed by the Tide from *B*, setting against it.

(1) See plate marked No. 1.

The same impediment exists in every other intersected part of the artificial Canal; and existing equally whether the Craft be Westward or Eastward bound: so that the length of the Cuts being so short as not to exhaust one Flood or Ebb to reach half way through them, it will be perceived that in the very principle of the project there is a fatal error—which indeed has been experienced—and it is the experience of this that has unquestionably given rise to the attempt to construct, what, in these Papers, is called “the Kullooar Dam,” a work which after a great expense in constructing, has given way to the united effects of a strong Tide, and the weight of a heavy inundation. This “Dam” was a Bund across the Kullooar Gong, or river, but it is manifest that the same means for checking contrafluent Tides are equally required for the other intersected streams, three or four of which indeed now appear to be proposed in Mr. James Prinsep’s Supplementary Report, dated the 3rd December last.

The way to form a system of Canals through such a country for the most expeditious passage Eastward, would be by diagonal lines of Canals running South East, thence, to North East, thus⁽²⁾—so as to fall in with the general direction of the Tides (which is North and South) for the sake of avoiding contrafluent Tides, and also in order to preserve, as much as may be, the strength of current. In such a system, if the length of each diagonal Cut were equal to a passage of one flow of Tide, a boat would make the passage of the Sunderbuns without one moment’s interruption, in as many Ebbs and Flows as there were diagonal Canals or Cuts; whereas, by the present system of direct Cuts, the Boat must anchor at half passage, either all the Ebbs or all the Floods, and consequently, the time of passage will be double.

(2) See plate marked No. 2.

Now it will probably be found, that the old Sunderbun passage (which is all by natural Streams, with the exception of the short Cut of Tolly’s Nullah) has in more or less perfection this essential requisite of diagonal direction, and hence it is, though the distance of that passage is considerably longer, yet that it is in fact the shortest, that is, in point of time.

But besides the radical defect, as to delay, the opposing Tides in the Canals produce slack water in them, and its necessary consequence—the deposit of Sand and Silt, which will in a comparatively short period choke the passage entirely.

These are errors which apply to the general scheme. I conceive that another great error has been committed in leading the Canal into the Salt Water Lake—this Lake, being too shallow, it was originally proposed to confine the Channel by means of Embankments and to increase the depth. It was found, however, that Embankments were impracticable, but dredging Machines could be used, and were had recourse to. They have however been employed to perform work for which such dredging Machines are but little calculated,

namely, the excavation of firm ground, instead of mere deposit—and I apprehend to little purpose, inasmuch as it is quite impossible in an open shallow Lake, to keep for any length of time a particular track through it at an extra depth, to say nothing of the sliding in of the sides and mud deposit there, from the annual inundation—even the motion of the water occasioned by the wind, will fill the Channel in a short period.

The Canal should have been carried along the Bank of the Lake, and the water in the Lake might then by means of Sluices have been made to scour the Canal ; or the Canal might I presume have been made to drain the Lake, and thus to recover a very large tract of valuable land to Government, now a complete waste.

But more especially ought this to have been done with reference to the great difference of level between the Lake and the Hooghly, involving as it does the question of danger from irruption of the River. Had the Canal been carried round the verge of the Lake, a distance of 12 miles, instead of 7 or 8 as originally expected, (but $5\frac{1}{2}$ is only now available) might have been obtained through which to distribute the 12 feet of superior height of the River in the rains: which would have reduced the current in the Canal to a more moderate velocity.

Thus the Scheme appears to be defective in its original design.—I shall now shew that the advantages contemplated from the communication were obviously fallacious, and are utterly incommensurate with the enormous expense of the undertaking.

Captain Schalch himself says in his Printed Memoir of the present passage, by Tolly's Nullah "that when first excavated it (Tolly's Nullah) was perhaps sufficiently large for the "Trade, &c. ; but that it is quite inadequate to the present Navigation is evident from the "fact, that at certain seasons of the year, when a free passage is most required it is choked "up with Boats for a distance of three or four miles, &c. The increased population of the "Town (of Calcutta) demanding a larger supply of fuel, the wood Boats, *which are the* "principal cause of obstruction in the Nullah, have increased, &c.—*Memoir page—.*"

(1) See App. to
App. (G) page iv.

Here then we find that the wood Boats are "the principal obstruction to" the old passage by Tolly's Nullah, which otherwise would not be "inadequate to the present Navigation," and we have seen by Mr. Prinsep's Report that this old passage is shorter than the new, in point of time, by 12 hours in twenty-two ; so that we arrive at the conclusion that were it not for the wood Boats, the Canal would not be required ; and as a consequence that the advantage of the new communication is limited to the accommodation of the Craft employed to supply Calcutta with firewood. But, after all, it appears that the number of Boats passing Tolly's Nullah, even including the numerous wood Boats, does not average 900 in a* month ; therefore both passages being open, and supposing that one-half of these 900 Boats, in spite of the longer period by one-half required, shall nevertheless proceed by the Canal, the number of Boats passing would be 450 monthly—and the advantage to Government would be, that, 450 Boats would pay their Toll at Chitpore on the north of Calcutta, instead of paying at Tolly's Nullah on the south—and for which Government would have to keep up a double establishment of Toll gatherers. For the crowded state of Tolly's Nullah does not diminish the number of Boats which pass, although it must delay individual boats. The same quantity of fuel, I presume, is consumed in Calcutta, and must be brought.

* See Register in
Captain Prinsep's
Report.

Nor would a more open Canal induce Woodmen to bring more firewood without an increased demand ; in point of fact, the demand has very much diminished, since the period at which Captain Schalch's Memoir appeared, from the diminished consumption of Bricks required for Buildings, and from the more general use of Coal for fuel as well as for burning the limited quantity of Bricks now in demand.

On the whole, therefore, it appears obvious, that the importance of the object in view cannot be deemed in any degree commensurate with the magnitude of the labor and ex-

pense requisite to attain it.—I now purpose to shew, in the 3rd place, that the attainment of that object is undoubtedly attended with no inconsiderable risk to the Navigation of the Port of Calcutta.

Supposing the Canal to be opened as intended, and that there were no danger to be apprehended from an irruption of the River by it into the Salt Water Lake, it is manifest that every cubic inch of water which is admitted to pass from the Hooghly by the Canal, must in due proportion, diminish the velocity of the current from which it is withdrawn.

But velocity of current is indispensable near the mouth of every River, and especially of the muddy mouths of the Ganges. The obstruction, therefore, of so considerable a body of water from the River above the Port, and so near the verge of the Sea, the line of ultimate deposit, cannot possibly be harmless.

The danger to the Town of Calcutta from the irruption of the River by the Canal is the last mentioned objection to the scheme above noticed. In stating this objection the real questions are, What is the extent of danger from the scheme, and what is the amount of advantage to counterbalance that danger? For, were the advantage great, the danger might be tolerated. But we have seen that the advantages are not capable of balancing any degree of danger.

It will not be expected that the projector of a Scheme such as this, would amplify the danger that might result from its adoption. In perusing the Memoir of Captain Schalch, however, it must I think occur to every one, that although he endeavours to combat the fears entertained for the safety of Calcutta, yet he did not feel the same confidence in that respect which has since been evinced. In his original Plan, Captain Schalch states "that he avoided suggesting a communication between the River Hooghly and the Salt Lake," and the fact of his shutting out the River altogether by double bunds during the rains, can hardly escape notice. Captain Schalch, indeed, broadly declares his fears in the following words: "From the former velocity of current (of $2\frac{1}{2}$ miles in the dry season,) I should apprehend little danger either to the Bridges or to the sides of the Canal, but very reasonable fears may be entertained of the inability of the Bridges to withstand the latter, (the force of the current in the rains of $3\frac{3}{5}$ miles.) It is therefore my opinion, (*founded on this consideration alone*) that the communication between the River and the Lake should be obstructed during the rains."—Captain Schalch's Memoir, page 15 and 16.

Captain Prinsep conceived, that he could regulate the influx of the River, notwithstanding the great difference of levels, though to him it was known that the range of Canal, over which to distribute the fall, was shortened from 7 or 8 miles, as expected by Captain Schalch, to $5\frac{1}{2}$ miles, by means of Locks or Flood Gates, instead of Bunds.*

It thus appears, that Captain Prinsep's opinion is opposed by that of the original projector, Captain Schalch, as to this part of a project, which involves, as some seem to apprehend, the safety of the Port of Calcutta, and probably a considerable portion of the Town.

But in the views taken by both those gentlemen, as to the principal grounds on which they estimate the extent of danger, namely, lightness of Current in the River and Canal, I cannot concur. They have indeed quoted Scientific writers in Europe, and have referred to the Chevalier de Buat and others for principles which regulate currents; and the velocity given by Rennell to the Ganges, viz. "in the rains 5 miles an hour, on a descent of 4 inches per mile," is brought forward in confirmation. But the essential fact on which the whole rests is omitted, namely, that the current stated by Rennell at 5 miles an hour, is the *average Current*, or as he calls it, "the *medium rate of motion*" of the *whole River*,

* I do not deem it necessary to enter into the question whether the preference is due to Bunds or Locks—for the latter might be shut altogether during the rains. The question is, the admission of the heavy current.

and not the current of any particular portion of it, much less of a portion like that of the Canal into the Salt Lake, where the fall, instead of 4 inches, is 30 inches per mile, 12 feet in $5\frac{1}{2}$ miles. On the contrary, Rennel positively states, and that too in the same work from which the quotations of a 5 mile current are taken, after noticing that "in the wet season and during the draining off the waters, the current runs from five to six miles an hour," adds, "but there are instances of its running seven and even eight miles in particular situations." "I have," he says, "an experiment of my own on record, in which my boat was carried 56 miles in 8 hours against so strong a wind that the boat had evidently on progressive motion through the water."—Memoir page 143. Such a passage as this, existing in the same work from which extracts are made, a work whose authority is quoted as the foundation or the support of the project itself, should not have been omitted. But what is the conclusion now that we see the omission? Why this—that if danger was to be apprehended—that if the foundation of Bridges could not resist, in Captain Schaleh's opinion, a current even of $3\frac{3}{5}$ of a mile, the scheme must be altogether abandoned; for that there will and must be a current, at this spot, of fully twice $3\frac{3}{5}$ velocity, perhaps much more.

It seems to me however, to be not a little remarkable, whilst the Engineers employed in this undertaking have entered at large into speculative opinions, and have adduced data raised on the theories of other men to shew the safety of the plan, that no notice is taken of the accumulated velocity of current occasioned by the simultaneous effects of a strong Ebb Tide and a heavy Current pressing upon it; and it is still more extraordinary that they did not themselves go to the spot, and at the height of the rains, the period of danger, ascertain by trial, the real and true strength of the Current actually passing before the mouth of the Canal, and which it would have to encounter! If, as alleged, fears were unnecessary, this must have silenced them, or it must have terminated the scheme entirely. In all these voluminous Memoirs and Reports, I have seen no reference made to such an experiment; and in consequence, I have requested our Secretary to procure* through the Master Attendant, the requisite information, to be had no doubt in that Department, namely, the strength of Current in the Hooghly at the Ebbs of the Spring Tides in August and September, from Baloo Khal, about two miles above, and at the mouth of the intended Canal. When it is received it will be laid before the Board as an Appendix. But in the meantime, from personal knowledge, I may venture to say, that the Current at the spot in question is a very strong one, and I think must be 8 or 9 miles an hour at least; and be it here remembered, that it is the extreme highest Tide and Current that is to be guarded against; for a breach once made by one Tide through our soft alluvial soil and frail brick bulwark, on which the defence of Calcutta is to depend, the full extent of destruction, whatever that may be, is inevitable.

The Board must of course be unwilling to encourage alarm on an occasion like this, but the effects produced by the irruption of Rivers in this country must be familiar to us all. Captain Schaleh himself describes these in very forcible terms in speaking of the Cut of *Sooty Canal* at the head of the Hooghly. "I saw the Cut," says he, "when only a few yards wide, but the stream was no sooner admitted, than it quickly expanded to as many hundred (yards,) and two years after its completion not a trace of its existence remained (as a Canal,) and only a few months ago the middle of one of the principal streams of the Ganges was pointed out to me as the spot where the excavation had been made." Here is a description by the projector himself, of the sudden and tremendous devastation which

* Vide No. 7. of [Military Board's] Proceedings, 15th February 1831. [In which the Master Attendant states that between Baloo Khal and Tolly's Nullah the Ebb, in his opinion, runs from 5 to 7 miles per hour during Spring Tides, in August and September.—J. M.]

this very River Hooghly made, at a point too, where there was hardly any fall, merely by straightening the line of current.

And this leads me further to observe, with reference to the position designed for the head of this Canal, that it opens into the Hooghly just at that point, or very nearly so, at which it will receive the whole strength of the Current straight from the Western Reach, which throws it up precisely in the direction of the Canal's mouth. This was probably seen, and to avoid its effects, the mouth of the Canal is made to incline with a curve to the Southward. But I question the propriety of this, for by looking at the progress Sketch for 1829-30, it would seem to render the first Flood Gate liable to be taken in reverse by any encroachment of the River, thus⁽¹⁾, where the triangular spit [*?spot*] of ground *a, b, c*, appears to offer but little resistance; nor ought we, in judging of the danger of this scheme, to overlook the Report of Capt. Prinsep, as to the nature of the foundation to be obtained on this line of Canal. He states, that oozing sand (which oozing sand is described elsewhere to be a perfect fluid,) in fact a deep quicksand, is found at 18 feet below the surface in some parts,* and all along an average of 23 feet; whilst the Canal is to be excavated to the depth of from 15 to 19 feet. So that we have this danger also to encounter, and that too, not with the materials (large masses of stone) in use in Europe for such undertakings—nay, it is not even proposed to pile the foundation, substituting—no doubt influenced by economy—an inverted arch for the foundation and sill of the water-way; a very inferior expedient. In short, we have nothing but the infirm material of Brick, resting on an inferior stratum of clay, perhaps over a quicksand. These are the means and materials proposed to support a Flood Gate pressed by the weight of a heavy body of water, and the force of a powerful Current which it is made to oppose; forgetting also that such opposition will throw its latent force into heavy action downwards, so as to undermine the sill or pavement below, as well as laterally, where its swirl acting on either side may possibly lay the whole foundation completely bare, cut in behind it, and ultimately carry it away entirely.

That in a soil so tender as that of the alluvion of Bengal, this would be the effect of a heavy Current setting into this Canal, I think is by no means improbable. The safety proposed by Captain Prinsep, is by shutting out the River by means of these Gates, which were to shut of themselves. He says notwithstanding, "It is my intention to have "the means of fastening the Gates back when it is safe, reserving the power, in case "the stream should become too rapid for the safety of the Canal, of closing them, "and diminishing the flow of water at any time while the tide is flowing." Then a gage was to be fixed to the Gate, to shew when it was to be closed; and this Captain Prinsep believed would be when the water rose about 6 feet above the surface of the Lake—thus leaving a body of six feet more pressing against the Gate; and this he states, could not be a difficult matter to regulate, nor at all beyond the capacity of a native peon or a classie"—Report. We cannot say that there is no danger here. I have no such confidence in a peon or a classie, or in the scheme itself; we cannot conceal from ourselves the miscalculations as to the power of the River to be opposed: and which having been misconceived by those who have been recommending the scheme and carrying it on, have consequently not been provided against. It is indeed a very different thing to advocate the feasibility of this undertaking on the supposition that it will have to oppose a current of $3\frac{3}{5}$ miles, or even 5 miles only, and our sanctioning the proceeding with the work in the face of demonstration that the current is of double that intensity.

On these grounds I cannot hesitate to declare my conviction, that the scheme was injudicious from the beginning, and ought no longer to be persisted in. It has been imagined

* "At Chitpore cross Road," near which the Gates must be; in some parts, the "oozing sand was found at 19 feet." Captain Prinsep's intention to carry the foundation through the first bed of oozing sand, leaves it equally probable that a second bed exists, not far below the first.

(1) See Plate marked No. 3.

that what is termed the Circular Canal,—that is, that part of the line which runs from the Hooghly to the Salt Water Lake,—has a distinct value, independent of the portion termed the Eastern Canal, and should be prosecuted to completion, though the other were abandoned. But the Circular Canal is part of the original scheme, and cannot be separated from it. I believe the position should be reversed, and that the Eastern Canal, if there be a distinction made, might possess a separate value, and not the Circular Canal, which is moreover that part of the scheme from which alone, whatever injury to the Navigation of the Hooghly or danger to the Town of Calcutta is to be apprehended, must arise. But were there no such apprehension, I can see nothing adequately valuable in this part of the work to induce me to countenance its separate prosecution, whilst it is extremely probable that it would produce such an alteration of level in the Lake as would materially injure the Drainage of Calcutta* as a Canal by itself, and as separated from the Eastern passage. I deem the Circular Canal insignificant; I consider the value of that Canal to depend on the Eastern Canal being useful. If a boat cannot pass through the Sunderbuns by it, of what use is it that it may get as far as the Salt Water Lake, then to be compelled to take the old route!

On the whole, therefore, I entirely concur in what indeed the present Superintendent, Mr. James Prinsep, has fairly and candidly stated, after enumerating in various instances, the impracticability of permanently completing the operations—"that experience has long since proved that Captain Schalch's scheme of a permanent line of Canals, crossing the upper ramifications of numerous tideways cannot be maintained in such a soil as that of the Sunderbuns, with sufficient depth for large Boats: whilst ample evidence has been afforded that it must soon become a series of tide Channels, passable only at high-water."

Appendix (H)
page 112.

Here is the conclusion, at length arrived at, with respect to the Eastern line; but I will go farther than Mr. Prinsep, and express my opinion, that the Western part of the scheme the "Circular Canal," is equally a failure, inasmuch as it is impossible that it can possess any real value, distinct from the other: at all events, it can possess no value which ought to induce the Board to recommend the continuance of an outlay on it which may yet exceed several lacks of rupees—whilst even the success of the operation, with reference to danger from irruption of the River and injury to the Navigation of the Hooghly, may (it is at least possible) prove the most unhappy circumstance attending this very imperfect and utterly successful undertaking.

ibid,—page 84.

Finally, I will now endeavour to show, from Mr. James Prinsep's Report of the 15th September, and 3rd of December last, the present state of the Canal throughout, and the difficulties, which a perusal of these documents evidently warns us, do exist, in attempting to bring this work to a satisfactory conclusion.

Appendix (H)
No. 128, page 112.

A passage, such as it is, exists between the Entally Canal and the Ishamuttee by the new route, and its general condition is this.—"From communication with so many tideways there is," says Mr. Prinsep, "a rise in the Canal to the extent of the tide lift, so that at high-water there is a passage for the largest craft, and at low-water the bed is laid nearly dry at many places." "But, to place the Navigation on the best footing, the Kulloor Gunj, the Gobra, the Doodbeebee, and Kantatulla streams must be firmly bunded." "But the question of bunding resolves itself into the more general one—whether the new Navigation shall be that of tide passages as at present, (passing at the top of the tide) or a Canal." "To render it a system of Canals would require full 50,000 rupees laid out upon the three large bunds;† besides their constant protection from accident; for the several bunds on the Doodbeebee Khal were entirely carried away last rainy season." "To render it a tide

† But there are four bunds.

* Note.—Captain Prinsep does not admit this if his plan of gates be adopted; but he says—"There is however sufficient reason to suppose that it (the free admission of the tide, according to Captain Schalch's plan) would tend disadvantageously upon the present system of draining the Town."—Captain Prinsep's Report.

" passage requires only unavoidable repairs—the preservation of the tracking path, and to " clean out certain portions of the Bahmungutta, the Chultabarya, (the banks of which have " partly sunk) and other parts which impede the Navigation"—and to excavate deeper certain portions of certain " Canals unfinished," or " whose banks have fallen in". These are heavy items, and serious sources of expenditure in prospect.

But the work of excavation is not of so easy a nature. Mr. Prinsep says, in speaking of a portion of the Bayley Gunge Canal, " The earth of the Soonderbun alluvium is so " soft, that, when moistened with water it loses all trace of the spade, and acquires of itself " a level like treacle or pitch." In this Canal " it filled in from below, as fast as the laborers " removed it; at one place a sudden sliding in of 250 feet of the bank filled the bed $3\frac{1}{4}$ " feet."—Adjoining this " lay a stratum of sand of 600 feet, through which the excavation was made. After four feet deep was gained with some exertion, the oozing sand from below seemed to set at defiance all further endeavours"—" 875 feet remain to be excavated, 3 to 4 feet." " I refrain from estimating for this, being by no means confident of the practicability " of deepening such a soil in a permanent manner". " This Canal, the Committee are aware, " has already once filled in since it was excavated by Captain Schallch in 1824-25." " Concluding thus—" that experience has proved Captain Schallch's scheme of Canals im- " practicable for large boats:" " they must soon become Tide Channels, passable only at " high water."

These extracts give some idea of the obstacles opposed to the future success of the undertaking now before the Board, as they have been ascertained to exist by the test of experience, dearly as it has been bought—and certainly they are obstacles, which no stretch of prudence can justify us in continuing to oppose.

It is necessary however to state also the advantages enumerated by Mr. Prinsep to be derived from the new line of communication. " These are such as in Mr. Prinsep's opinion, " ensure it the preference over the deep and dangerous* streams of the Sunderbun forests, " for the frail boats which ply from the Eastward with wood, lime, fish, rice, mats, thatch, " vegetables and passengers"; and it is stated " that an average of 200 boats per day, from " the Dinghee to the 1000-maund Pulwar, pass through the Bahmunghatta Canal in Sep- " tember, when the Hooghly is open; so that it may be, he observes, expected that in the dry " season the traffic would be doubled".† Mr. Prinsep indeed states in his letter of the 3rd December, that " the wood boats from Roymungul tell him they save three days in their " trip" by the new route; but as this is directly opposed to his own experience, and to what he has distinctly reported, as above quoted, I am unable to reconcile the statements, and am disposed to think some mistake has been made—the more especially as the distance to the Roymungul, below the allotted lands, appears to be greater by the new than by the old route, " and as connected with the convenience of the Canal" he begs leave to point " out the advantages of establishing villages along it," " Ferries also," and " Tolls should", he observes, " be imposed:"—the rates to be fixed however " with reference to the old route, being accessible to all."

These are advantages, no doubt; but they are of a very trivial nature: and, certainly not such as to warrant our recommending any outlay of public money at the present juncture in realizing them: all the articles above enumerated are abundant in Calcutta, and cheap;

* I am not aware of any danger in these passages as a reason for instituting the work—it could not be maintained.

† Note.—The Bahmunghatta Canal appears to extend about 10 miles beyond the end of the Entally Cut—we are not told where these boats are bound to; whilst in the Register kept at Tolly's Nullah, as above, the average number that pass is about 30 per day. I observe also, that of the " 200 boats here reckoned by Mr. Prinsep to pass Bahmunghatta," only 59 are what he classes as " large and middle size;"—the remaining 141 are " Dinghees," and " Saltee boats" still smaller than the Dinghee—see Statement E of his Appendix.

wood, lime, fish, rice, mats, thatch, vegetables—all these have always been abundant ; but on such articles I question whether any additional Toll or Tax could be imposed—certainly not without sending them all into Tolly's Nullah, as now. Mr. Prinsep indeed himself, in his Report of the 3rd of December, however unwilling naturally to abandon wholly and at once the undertaking, says " I am inclined to recommend to the Committee to leave the works as at present, at least for a year or two, when a criterion may be formed of their success," meaning however, that the Eastern, not the Circular, Canal, should be left.

Whether therefore we judge of the work from its own imperfection of design, or from the inadequate advantages it holds out, or now from the experience which has been obtained of its impracticability, as is manifest from these documents, I conceive the Board has but one duty to perform ; and that is, to express their decided opinion that the work should be immediately suspended, not merely as Mr. Prinsep designs, on the Eastern Branch thereof, but throughout the whole line of operations from the Hooghly Eastward: recommending that the whole establishments be paid up and discharged, and that all purchases of land for the Canal not yet completed, be in consequence, put a stop to.

I would further propose as immediately connected with this subject, that the Board direct those who may be in possession thereof, to furnish us without delay, with such information as may enable the Board to see the precise state of the direct communication between the Hooghly and the Ganges, by the Jellinghee, that being understood to be the passage most open at present, when I am not altogether without hopes that some measures may be devised for the better keeping open of the direct communication with the great River through the flats of that stream.

25th January, 1831.

(Signed) A. G.

I have seen answers by Captains Forbes, Colvin, and Fitzgerald, and by Mr. Kyd, to certain queries on the subject of the Flood Gates, but I do not consider them of any importance to the present questions.

CIRCULAR CANAL.

Since I wrote the former part of this Minute, I find that a greater degree of importance is attached to the " Circular Canal," than I conceive that part of the original scheme merits ; I am therefore induced to add the following to what I have above stated.

It is obvious that the only advantage anticipated from the continuance of the Circular Canal into the Hooghly, is that of opening a passage on the North side of Calcutta from the River into the Entally Canal, that boats may pass into it ; and continuing through the Salt Lake, make their way so as to join the *old route* through the Sunderbuns by Tolly's Nullah near Tarda, instead of going as now from the *South side* of Calcutta through Tolly's Nullah itself from the Hooghly. Were there no passage from the Hooghly by Tolly's Nullah, that indeed would be an object.—But as there is, what is the value of another passage ?* Is the Circular Canal to afford a shorter passage round Calcutta to the old route at Tarda ? I believe the distance is greater than by Tolly's Nullah by *space* ; and if reckoned by *time*, taking dead water and winds in the Salt Lake, the delay in passing Locks, &c., I apprehend the new route will be much the most disadvantageous.—Is it because Tolly's Nullah is choked up by Boats that a new passage is called for ?—This was argued by the projectors of the scheme. But will not the new Canal when opened, if frequented at all, in a month, after it is frequented, become also choked up ? Certainly it will—for this reason, as must be

* It is to be kept in mind that water communication with the Sunderbun old route exists as far as the Town now, and round a portion of it.

obvious to every one who has seen Tolly's Nullah—That Nullah is not choked up by boats merely in *passing*. Any number might pass through if not obstructed. It is by permitting the Nullah to become a Harbour, by boats lying there, laid up in ordinary there, and delivering cargo there, that Tolly's Nullah is obstructed—and this obstruction extends to a distance Eastward, beyond which it becomes no longer profitable to unload, on account of distance from the Town for land-carriage. This I conceive is what will always regulate the limit of obstruction; and were ten Canals cut instead of two, and they were all used as *Harbours*, they would all of them be choked as now; and in case of an opening into the Hooghly, with an additional reinforcement of blockading Boats from the River.

The remedy of a new Canal then (the Circular) I should conclude cannot be successful in this respect; whilst as a passage it can possess no advantage, but the contrary—being moreover saddled with the enormous incumbrance of locks which are not to be opened, and cannot be opened at all times.

What then is the remedy? That is the point; and fortunately it is a very simple one. Restore Tolly's Nullah to its original purpose—make it a *passage* merely—instead of Harbour, and the cost of any more Canalling will be entirely saved; and the apprehension of injury to the Navigation of the Hooghly and from irruption of the River will be obviated. This is to be done by imposing a continuation of Toll, on all boats which remain in the Nullah beyond a fixed time allowed for passage.

As far as water and way go, I understand Tolly's Nullah is a far better passage now than any we can contemplate by the new Canal through the Salt Lake; and it might easily be improved and kept free by means of scouring Sluices connected with the Bridges at present across it, at a much less expense, I conceive, than will be required for keeping open the Circular Canal, even were it successfully finished—a point which I by no means feel assured of attaining.

28th January, 1831.

(Signed) A. G.

No. 10.

MINUTE BY COL. SIR THOMAS ANBURY,
Chief Engineer.

I have perused with the utmost care and attention, the whole of the accompanying Papers, and with every consideration on the matter; and in vain have I searched for, and am consequently remain uninformed of the advantages that have resulted from the Mofussil works, or Sunderbund Canals, or what the return has been for the excessive expenditure they have incurred. It may not be perhaps irrelative to mention that in 1786 or 1787, I was employed, while Assistant in the Surveyor General's Office under the late Sir Mark Wood, and by him sent to explore a part of the Sunderbunds from Tolley's Nullah, via Tardah through the Creeks to the Jubboona or Issamutty, and thence to the Chogdah Nullah, a little above Ishapore; and the Report I believe was satisfactory that a Canal or Canals in that direction would be a hopeless undertaking, or one at an excessive cost bearing no proportion to the advantages likely to be obtained.

It seems in the present operation that Bunds are continually required to be made or renewed at a heavy cost, such as the Kulloar Dam (the position of which however I don't find in the map) without any exemplified Statement of the profits or advantages to be derived from the Muffussil or Circular Canals. Under these circumstances, and on full and mature consideration, I feel considerable difficulty in deciding whether the work ought

or ought not to be prosecuted ; the enormous sum of 13,00,000 of Rupees of outlay and no advantages apparently gained, or incomings stated in set off thereto, renders it I think, very questionable if such an expenditure should be persevered in without essential advantages commensurate with the expense being made more manifest.

I think the progress made on the grand Eastern Canal should be noted or marked on the Plan by some distinguishing colour; and the separate cost of it and the Muffussil Canals should be separately detailed, when probably a better judgment might be formed.

(Signed) T. A.

No. 11.

MINUTE BY LIEUT. COLONEL CRAIGIE.

I have read with much attention Mr. Prinsep's Report of his operations on the Canals during the past year, and of his proposed scheme of operations during the present season.—I have also referred to the past proceedings of the Canal Committee connected with the execution of these important works, and have personally communicated on the same subject with some of the most scientific and intelligent individuals at the Presidency.—The result of my investigation is a decided conviction, that the scheme of operations proposed by Mr. Prinsep for the present season, should be approved, and more particularly that the execution of the Circular Canal should be prosecuted to completion with the utmost energy, in order that the Community and the State may as early as possible reap the benefit to be derived from that work, and from the other Canals already constructed.

It must be admitted I think, on a consideration of past Proceedings, that the execution of Major Schalch's original scheme of establishing a free communication between the Gurroy River at Koolna and the Hooghly at Chitpore, by means of a succession of Canals at the head of the Soonderbunds, has been found on experience to be attended with more difficulty and expense than the projector contemplated.—Mr. Prinsep in his present Report distinctly states, " Experience has however long since proved, that Captain Schalch's scheme " of a permanent line of Canal crossing the upper ramifications of numerous tide-ways " cannot be maintained in such a soil as that of the Soonderbunds with sufficient depth for " the Navigation of large Boats, while ample evidence has been afforded that it must soon " become a series of tide Channels, passable only at high-water." Mr. Prinsep adds, at the same time, that " as long however as the apex (if I may so term it) of each section is " situated at such a distance from the last as to occupy the period of one tide nearly in the " passage of a Boat from one to the other, there will be no great disadvantage in such a " scheme."

It must further, I think, be admitted, that the construction of the Canals which have been already executed through the Soonderbunds, has not in point of time been found productive of much advantage to the navigation—Boats it would appear can traverse the Delta by the old route as speedily as by the new route, notwithstanding the advantages of the Canals—on this point, Mr. Prinsep states, " still it must be confessed that nothing is gained in point of velocity by the new route, although one-third shorter than the old Soonderbund passage, for the same tides partially employed in the one case will transport a Boat over the longer distance with equal facility."

It seems thus to be established by Mr. Prinsep's Report, that the difficulty and expense of constructing Canals through the upper part of the Soonderbunds by the line pro-

Appendix, (H)
page 107 and 128.

posed by Major Schalch, are much greater than [than] was contemplated, while at the same time no saving of time is obtained in following the new route.

The chief advantages that seem to have been gained by the construction of the works in the Soonderbunds appear to consist in the diminution of danger from the avoidance of some of the largest Rivers, and in facilitating communication with particular points in the Soonderbunds. On these points, Mr. Prinsep states, "already the greater part of the Navigation has been attracted into the new Channel, and I encountered Boats of the largest size (1000-mds.) in my route. The wood Boats from the Roymungul tell me, that they save three days in their trip, besides the diminution of danger."—In another part of this Report Mr. Prinsep states, "The annexed statement (Appendix E) shews that an average of nearly 200 Boats per diem pass through the Bamunghatta Canal, (and consequently through the whole line, or at least from Mundaree) varying in size from the Dinghee to the 1000-mid. Pulwar, during the month of September, when it must be remembered the whole Navigation from the Ganges is diverted from the Soonderbund route; so that it may be expected that the traffic by the Canal will be at least doubled in the dry season."

Under the results now established of the great difficulty of constructing real Canals in the Sunderbunds, and consequently of the little benefit in respect to time derived from pursuing the new route, I think Mr. Prinsep has been judicious in suggesting a discontinuance of the further prosecution of Major Schalch's plan of Canals through the Soonderbunds, and in recommending the Board "to leave the works as at present, at least for a year or two, when a criterion may be formed of their success"—the only expense to be incurred on the Canals already made in the Soonderbunds will be in repairs and in improving the tracking ground, which, according to the Estimate for the present year, will be inconsiderable, and in future years may be expected to be still less.

The difficulty which has been experienced in constructing and in maintaining Canals in the Soonderbunds, do not appear to me to justify a discontinuance of the prosecution of the Circular Canal at a time when the chief expense on that work has been already incurred both in the purchase of nearly the whole of the ground, and in the execution of nearly the whole of the excavation. The Appendix to Mr. Prinsep's Report shews that nearly the whole of this Canal has been already constructed, both in respect to excavation and Bridges, and that the works at Chitpore are the only portion of the undertaking of any magnitude which remains unfinished. Under such circumstances I cannot agree with Colonel Galloway in recommending a discontinuance of this work. On the contrary, I would urge the prosecution of the small portion of the Circular Canal which remains unfinished, with the utmost energy, convinced that the completion of this work will be attended with great and permanent advantage to the State and to the Community at large. I am not prepared to say, if the work were still to begin, and if no expenditure had taken place upon it, I would recommend its execution, on a conviction that the advantages to be derived from it would more than counterbalance the whole cost of the Canal. On that question I am not required to give an opinion, and therefore think it unnecessary to enter on its discussion here. I look at the advanced stage of the work at present, and at the expenditure which has already been incurred upon it, and then I hesitate not to say that I think it infinitely preferable to prosecute the work to completion, than to stop short when the Canal is almost on the eve of completion.

It appears to me quite certain that the construction of the Circular Canal, establishing as it will, an uninterrupted Navigation between the Hooghly and the Soonderbunds by means of the Eastern Canal, the Channel through the Salt Lake, and the Baminghatta, (all of which are now open, and will be much benefited by the waters of the Circular Canal) must be attended with much benefit to the Public, and productive of considerable revenue to the State. These advantages, I think, will result even should the prosecution of

the line of communication through the Soonderbunds, according to Major Schalach's plan, be stopped in its present stage, and yield no further advantages than are held out by Mr. Prinsep's present Report. I conceive I am supported in this view of the subject by the opinions expressed by the Committee which originally reported on Major Schalach's plans in 1823, by the Resolution of Government under date the 20th March 1823, when sanctioning the construction of the Canal, and by the opinions expressed by the late Captain Thos. Prinsep, in several parts of his Reports. In the original Resolutions of Government, of the 20th March 1823, it is stated—"It seems to be very doubtful, whether any more direct line of communication between the River Hooghly and the Ganges can be rendered navigable throughout the dry season; and there is thence reason to conclude that the work will afford a very important facility to the trade of the Western Provinces.

"4. Independently, however, of this branch of Commerce, the great utility of the projected Canal appears to be fully established.

"5. The information procured by the Committee, in regard to the value and nature of the articles brought to Calcutta from the Eastern Districts of Bengal, is much less full and satisfactory than might have been expected from the Officers who were consulted.—That the commerce is very extensive, is however certain. The number of Boats which pass through Tolly's Nullah and the Eastern Canal; the large amount of the Collections drawn from that source; the throng of carriages on the road leading from Calcutta to the Salt Water Lake, are alone conclusive on the point. The bulky nature of the articles in which the commerce consists, the low value which they bear at the places whence they are brought, contrasted with their prices in the Calcutta Market, are all circumstances calculated to enhance the importance of a work, by which a considerable delay will be obviated, and the charges of freight considerably reduced.

"6. Government had not long ago occasion to notice the great enhancement which had occurred in the price of Firewood, of which article the chief part of the cost consists in the expense of carriage. Of all other necessities, the prices have risen with the rising prosperity of Calcutta; and in proportion as population extends, and the sphere whence supplies are drawn is enlarged, it becomes of course important that the means of conveyance should be facilitated.

"7. The Collections which may be made in the Canal in question, will no doubt partly consist of Tolls that would otherwise have been collected in Tolly's Nullah; but the insufficiency of that Channel has long been admitted. The delays and difficulties which occur in the passage through it, constitute a serious evil—it could be rendered adequate to the trade which passes through it, only by an operation involving an heavy expense not only through the charges of the excavation, but in the purchase of much valuable Land lying on its banks: and after all would only imperfectly provide for the objects in view."

"8. It is impossible to contemplate its present condition, crowded as it is with Boats, and affording a long and inconvenient passage to the Soonderbunds, without a strong conviction that the Community have reason to complain of the appropriation of the Toll levied. For greatly as Government must benefit by every facility given to trade, it is plain such imposts ought to be regarded less as a source of direct profit than as a fund to meet the charge of maintaining and extending the Channels of commercial intercourse.—Viewing the matter in this light, the Governor General in Council would doubt the propriety of maintaining the existing Tolls, were it his intention not to adopt any arrangement for facilitating the approach to Calcutta: and in the stated receipts from Tolly's Nullah and the Eastern Canal, he recognises at once an assured ground of confidence that the work proposed by Lieutenant Schalach will be extensively beneficial, and that the expense of it may be met, without any pressure on the general resources of Government. All experience indeed

“ tends to shew that there is scarcely any application of capital more profitable than that which is directed to the object of improving the national advantages for internal Navigation, which the Delta of the Ganges presents; and that in sanctioning any work of this kind, the Question will generally be, not whether *Government cannot secure an adequate return; but, how far it ought to push the direct advantage, in consideration of the remoter, though not less certain, benefit, of an improved Commercial intercourse.*”

The foregoing Resolutions seem clearly to show, that the construction of the Canal in question was sanctioned by Government on the admitted insufficiency of Tolly's Nullah for the transit of the traffic between Calcutta and the Eastern Districts of Bengal, and on a perception of the commercial advantages that would result from opening a new Channel of communication between Calcutta and of the Soonderbunds, independent of the object of improving the communication with the Western Provinces.—The above advantages will be secured by the construction of the Circular Canal, which will admit the trade of the Eastern Districts of Bengal by the Bamunghatta Canal, the Channel through the Lake, and the Eastern Canal, the latter of which is always crowded with Boats, which would of course proceed onwards to the markets of Calcutta, if the Circular Canal were completed.

As it is manifest that Government considered the construction of the Canal in question to be justified on the grounds alone of its facilitating the communication between Calcutta and the Eastern Districts, it follows that any partial failure of the Soonderbund Canals, in effecting an improved communication with the Western provinces would not warrant, according to the views expressed in the Resolutions of Government, the abandonment of the Circular Canal, even if it had not been commenced upon, and cannot possibly justify the discontinuance of the work at the present time, when the chief expense has been already incurred, and when perhaps nine-tenths of the Canal has been executed.

I observe that the late Captain Prinsep, in his Reports to the Canal Committee, repeatedly expresses his opinion of the “superior importance” of the Circular Canal over the other parts of Major Schach's plans, and presses the expediency of an early completion of the work. The present Superintendent of the Canals, Mr. James Prinsep, entertains the same opinions; and as far as I can ascertain, the community at large, are convinced, that great and permanent advantages will result from the execution of the Circular Canal.

In considering the amount which has been expended on the Canals in question, it is to be borne in mind, that a considerable portion of ground has been purchased on each side of the Circular Canal beyond what will be required for the Canal and Roads, and which when these works shall have been completed, there can be no doubt may be disposed of to great profit. This therefore will form an offset against the first cost of the Canal.

On a consideration of all these circumstances, I can have no hesitation in strongly urging the prosecution of this work to completion with the utmost vigor; the only circumstance that could now induce me to admit the expediency of discontinuing this work, would be a perception of danger from the admission of the Hooghly into the Canal at Chitpore, as pointed out by Colonel Galloway. Under the opinions which have been expressed by the several scientific Officers who have been consulted in this point, and under the knowledge of much more extensive works of a similar description having been successfully executed in England, in America, and on the Continent of Europe, I feel assured that no real danger will arise from opening the Canal into the Hooghly at Chitpore, and that the admission of the water into the Canal in the Rains may be regulated by Flood Gates, or by other contrivances, so as to secure the Canal and Calcutta from any possibility of injury.

31st January, 1831.

(Signed) JOHN CRAIGIE,

No. 12.

MINUTE.

[BY D. McFARLAN, ESQ.]

The papers originally circulated for the Board's consideration, were Mr. Prinsep's Report of progress in excavating Canals, &c., and a Sketch of what still remains to be done.

2. The Board have, upon a perusal of these documents, been led into a discussion of the soundness of the views which led to the original adoption of the plan, and Colonel Galloway proposes that Government should be addressed to relinquish the further prosecution of the undertaking.

3. A Member of the Board who should take up the question of the soundness or otherwise of the original scheme, is no doubt justified in stating his convictions fully to Government, but I do not feel that I am called upon to revert to such a scrutiny, more especially as Col. Galloway's proposition comes, in fact, in regard to the Eastern Canals, to the same thing as Mr. Prinsep's, viz. that the works should be let alone for the present, or nearly so.

4. It is only I apprehend in regard to the Circular Canal, that Col. Galloway recommends a materially different course from that proposed by Mr. Prinsep himself, and therefore, it is only in regard to that work that I am called upon to state my views.

5. With reference however to the Eastern Canals, I may mention, in passing, that I observed a fact stated, viz. that the trade of the country has been attracted to them; I cannot therefore think that the expense has been thrown away; whether the returns may prove commensurate with the expense, remains to be seen.

6. The statement that no time is gained in the passage through them, is taken from Mr. Prinsep's Report. I have every confidence in that gentleman's accuracy, and if I venture to suggest that perhaps it may appear that more time is gained than he allows, I am bound to say, that I have no precise data to refer to. I think however that the casual information I have derived both here and at Jessore, (from travellers and landholders) pointed to the fact that a great deal of time was gained by the new cuts, amounting indeed, to as much as the difference between three days, and a day and a half.

7. This point therefore should be kept open for further observation. I am of opinion also that every minor and not expensive operation, tending to facilitate transit, (such as clearing tracking paths) should be had recourse to, and a moderate toll begin to be levied as soon as it appears that the traffic of the country has become well accustomed to the navigation.

8. I now revert to the Circular Canal. The opposition to that work is partly founded upon the apprehension of danger to the town and its drainage, from letting in the water of the river; upon this point I think I am justified in placing confidence in them (or a majority of them) rather than in doubts that might be raised in my mind from other speculations.

9. If it could be shewn that the returns to be had from the outlay still necessary to complete the Circular Canal would be less than the expence, and as a consequence, that the advantage to the public would be trifling, we might then think of recommending to Government the entire dereliction of the scheme; but, if even under the discouraging prospect that no return whatever would ever be had from what has already been expended to the Eastward, there is a fair probability that what now remains to be disbursed upon the Circular Canal, would be returned in the shape of interest from Tolls, and increased comfort to the people of Calcutta and the interior, it would then clearly be politic to persevere.

10. That this will be the case, appears from the parallel instance of Tolly's Nulla, which has yielded a sure revenue in Tolls. Will there be no adequate return from a Canal having the advantages of proximity to the Town, communication with the River, uniform depth of water, connection with the new and old Soonderbun passages?

11. Supposing the works to be stopped, all that has been expended, is lost and sunk forever, with the exception of the ruinous re-sale of patches of ground covered with banks of mud :—suppose them carried on, and we have the fair prospect not only of tolls, but of advantageous sales of ground on the Banks for Warehouses and Wharfs. Let it be borne in mind also, that Government are by their own Resolutions pledged to improve the Navigation, or to give up the Tolls, on Tolly's Nullah. They said in 1823, that they could not continue to levy a Toll for so hampered a Navigation. How can they do so now?—If they do not finish this Cut, they must give up a Revenue of 70 or 80,000 Rupees annually.

12. I have no hesitation therefore in joining heartily in Col. Craigie's sentiments, and in recommending that the works of the Circular Canal should be pushed with the utmost vigor.

? * Sanctioned by
Government.

13. The Eastern Canals may be left for the time in their present state, completing only the portion of the Bamunghutta Cut,* which remained unfinished from the early setting in of last year's rains.

14. The proposal for the formation of Dams across great Khalls for the purpose of stopping the access of tides from the Indian seas, had better, I think, be discountenanced. If we had no floods from the North, and Rocks for Foundations, the idea would be "bold" enough : in Bengal, with overwhelming Inundations from the North, and with a mud bank founded on a muddy or sandy foundation, and liable to saturation with water, nay, almost solution in the rains, as our only means of resistance, what chance can we have in the contest?

15. I am not sure that I am not going beyond my depth in the above remark ; and it may perhaps be urged upon me, that the Flood Gates at Chitpoor, which I approve of, are likewise proposed upon similar bold suggestions ; still, without presuming to add to the weight of authority in their favor, I may observe, that to my mind there must be a great difference between opposing the force of a current, and resisting the weight of a body of still water. The Mahratta Ditch has been open for many, many years, and I never heard of its having materially widened its bed ; a small machinery would surely have stopped it altogether ; why should not a stronger effectually stop the larger opening of the Canal?

16. I ought to apologize to the Board and the Government for not having gone more fully into the details of this question ; my newness to the Board, and the manifold avocations incident to my other Office, which also is new to me, and new indeed in itself, must plead my excuse.

(Signed) D. McFARLAN,

8th February, 1831.

Chief M. and M. M. B.

No. 13.

ADDITIONAL MINUTE ON THE SUBJECT OF THE CIRCULAR CANAL.

[BY D. McFARLAN, ESQ.]

Having further examined the history of the Marhatta Ditch, which was alluded to by me in my last Minute, I find that means have actually been taken to check the influx of water of the high inundations through the Ditch ; a note of the particulars of which I beg to submit ; it is supplied by Mr. Blechyenden, the Superintendent of Roads in the town, and its accuracy may be relied on.

The Sluice, the Board will observe, is not at Chitpore, but further to the Eastward, at Kanterpooker, and the real object in making it, appears to have been the protection of the Dum-Dum Road, as appears by the proceedings of the Magistrates of 2d November 1802. The protection of the Northern part of the Town was only incidentally mentioned.

As the above fact, and the others noted in Mr. Blechyenden's Report strengthen the conclusion arrived at in my former Minute, I beg the Secretary will be good enough to annex this paper to it.

(Signed) D. McFARLAN,

Chief Magistrate and M. M. B.

No. 13. a.

Mr. Blechynden will be good enough to note, for the information of the Chief Magistrate, what is the practice adopted for regulating the flow of water through the Mahratta Ditch, at the high spring tides in the rains, and what is the strength and description of the Machinery used to keep it out, if it is kept out; also, whether or not, it is the case that the water at those times penetrates through the Tunnels into the town, and makes its way Eastward.

(Signed) D. McFARLAN,
Chief Magistrate.

10th February, 1831.

In reply to the Queries of the Chief Magistrate, I beg to state—

1st. That the water is only partially kept out by sluices, according to the directions of the persons under whose immediate charge they are placed.

2nd. The sluice is occasionally opened at Kanterpooker (near the Baug Bazar branch of the Barrackpore Road) for supply of water to irrigate the Paddy lands, lying between Dum-Dum and the Salt Water Lake; as also at certain periods to prevent inundation to the low part of Baug Bazar, which would be the case, were the water pent up in that direction.

3rd. The sluices are of double planked Teak wood, well secured with Iron-work, and formed on the self-acting principle.

4th. The water does occasionally obtain entrance into the Town through the Tunnels, and assists in removing the filth collected therein.

5th. In addition to the sluice at Kanterpooker, one is placed at the Bankshall, which also carries water through the Tunnels into the Mahratta Ditch.

6th. At Bewannypore are sluices on a like principle, for the purpose of keeping the water from Tolly's Nullah out of the Town, when not required for the clearing the Drains.

It might perhaps be worthy of observation, that the opening of the New Canal might render new sluices requisite, for the purpose of irrigating the Rice fields near the Salt Water Lake at certain periods, as well as to prevent a too great influx of water into the Eastern part of the city.

(Signed) A. H. BLECHYNDEN,
Superintendent.

14th February, 1831.

(Signed) D. McFARLAN,
Chief Magistrate.

No. 14.

SEPARATE MINUTE, CHIEF ENGINEER.

Independent of the question of present or future advantage to be derived from the Eastern or Soonderbund Canals, on which the Government have, already, clearly expressed their views, in their Resolutions of the 20th March, 1823, and their opinion of their utility in affording "a very important facility to the Trade of the Western Provinces;" and after what has been advanced in the Minutes of the several members of the Board, I shall confine myself to the subject of the Circular Canal. After the expense, already incurred, in the purchase of ground in the direct line of the Canal, and on both sides, which on the completion of the excavation and opening of the Canal will become abundantly valuable; and if not retained for Ghauts, Wharfs, or other purposes, will by resale, produce a con-

siderable return on the original outlay; for I think it is hardly to be doubted, that there will be numberless individuals anxious for purchase, when the utility and benefits resulting from the Canal in a Commercial, as well as other views, becomes more evident or certain; besides the greatest portion, indeed nearly the whole, of the intended Canal being now excavated, as appears by the Progress plan, and little more to do than the setting up of the Flood Gates, it ought not in its present state to be abandoned; on the contrary, I am decidedly of opinion, that, whether it fully answers the original purpose intended, or not, after such an expense, it ought to be prosecuted to completion—and that agreeable to Mr. James Prinsep's recommendation; the Eastern Canal may be allowed to remain as it is—save as far as regards the necessary towing paths and requisite repairs to Bunds, essentially necessary for the protection of what has been already done.

The security of the debouchment of the Circular Canal towards the Hoogly, I have no apprehension from; as I have no doubt its security has been well provided for by the Superintendent, and that the known means of readily opening and closing of the Flood Gates, which I deem absolutely necessary, will be adopted. Under such precautions, I can have no question of the water of the Canal and the River being kept under due control. The replies of the four Savans, to whom the Queries relative to this point have been referred, confirm my opinion; and if the bank of the river, on each flank, is well secured towards the river, I cannot imagine any possible danger. The Mahratta Ditch is, in my recollection, now upwards of 46 years, and I never heard of any accident or danger apprehended therefrom, and I know it has been frequently contemplated as a means of connection between the Hoogly and the Salt Water Lake. It is next to superfluous to add, that I perfectly coincide in the opinions and sentiments of Mr. McFarlan and Col. Craigie, that the Circular Canal should be pushed on to conclusion with the utmost vigor, and that, any further, very expensive operations should be discontinued on the Eastern or Sunderbund Canal, without any reference to any future returns or advantages therefrom.

12th February.

(Signed) THOS. ANBUREY.

Since writing the above, I have had an opportunity of examining the model of the Flood Gates, which I am satisfied with.

(Signed) T. A.

No. 15.

No. 1037.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.

Vice-President in Council.

HONORABLE SIR,

Fort William, 22nd February, 1831.

Transmitting copies of documents on the subject of the Canals under Mr. Prinsep's Superintendence; the majority of the Board recommend that the Circular Canal now constructing between Ballia Ghaut and Chitpore, should be carried on until finally completed; and that the Eastern Canals should for the present be discontinued, with slight exceptions. Lieut. Colonel Galloway is of opinion, that the whole undertaking has failed, and consequently recommends, that the work be entirely suspended.

We have the honor to submit, for the information of Government, a Copy of letters addressed to the late Canal Committee by Mr. James Prinsep, dated 15th September and 3rd December last, and of the annexed report, showing abstracts of expenditure* on the Canals under his Superintendence for the year 1829-1830, the progress made in their construction, and a sketch of what is proposed to be effected during the present season.

* On Mofussil Canals, .. 30,603 13 1½
On Circular ditto, .. 72,840 11 1½

Ra. 1,03,444 9 0½

2. Mr. Prinsep's report of the practicability of executing and maintaining, in a state of permanent efficiency, the series of Canals projected, by Major Schalch, at the head of the Sunderbunds, is by no means encouraging. The difficulty of preventing their Channels gradually filling up by the process of silting, and

in some parts, by the oozing upwards of the sandy soil, appears nearly insurmountable; while the entrance of the tides into the Canals by the numerous rivers that intersect them, prevents the full benefit that was originally contemplated, by converting them into a series of Tide Channels, passable only at high water. So long, however, as each Cut will occupy a Boat nearly a tide in its passage, Mr. Prinsep considers, that this conversion of the Canals into tide passages, will be attended with no great disadvantage. It would appear from the Reports that the greater part of the trade has already been attracted into the new Channels, nearly 200 Boats passing Bamanghatta per diem, of all sizes, from the Dinghee to the 1,000 maund Pulwar, at the most unfavourable season of the year. Besides the diminution of danger to which native boats are exposed in crossing the great arms of the sea, there is a saving of time, to the extent of three days, as represented in Mr. Prinsep's letter of 3rd December, para. 7, though in his letter of 15th September, para. 25, he had estimated that there would be a loss of 12 hours for all boats of considerable draught using oars, in pursuing the new route.

3. On a mature consideration of all circumstances, the majority of the Board concur with Mr. Prinsep, in the expediency of discontinuing the prosecution of the Eastern Canals beyond the point they have now reached, and of leaving them in their present state, for a year or two, when a criterion may be formed of their success; during which period, however, some expense may be advantageously incurred in the clearing and smoothing of towing-paths. A majority of the Board also concur with Mr. Prinsep in the expediency of carrying on the remaining part of the Circular Canal to completion, with the utmost vigour, being of opinion, that it would be highly inexpedient to discontinue the prosecution of that important Canal, which is already fast approaching to completion, and promises to be productive of permanent public advantages. By means of the Circular Canal, the Eastern Canal, the Channel through the Salt Lake and the Bamanghatta Canal, a free communication will be established between the Hoogley and the Soonderbuns by a new tract, and thus, an important part of the objects designed by the Canals (according to the Resolutions of Government of the 20th March, 1823) will be accomplished. We see no reason to doubt the permanency of the above extent of Canals, which are all already completed, with exception to a small portion of the Circular Canal; and we think, great public advantage will result from the completion of that portion of the original scheme, even should the Canals to the Eastward of Bamanghatta entirely fail.

4. Lieut. Col. Galloway dissents from the opinion of the other members of the Board; he considers the whole scheme to be in itself intrinsically defective, and to have entirely failed. Mr. Prinsep, indeed, has stated that "experience has long since proved that Capt. Schallch's scheme of a permanent line of Canal, &c. cannot be maintained in such a soil as that of the Soonderbuns, with sufficient depth for the Navigation of large boats, and that it must soon become a series of tide Channels passable only at high water," para. 22. Again, "I am by no means confident of the practicability of deepening such a soil in a permanent manner," para. 20. Further, "Still it must be confessed that nothing is gained in point of velocity (quickness of passage) by the new route, although one-third shorter," para. 23. "The tide Navigation of the line of Canals may be disposed of as follows—

By the new Passage, hours,	..	..	..	..	...	..	34
By the old Route, hours,	..	..	...	..	..	..	22

"Hence it appears that there is a loss of a whole day in pursuing the new Route for all boats of considerable draught, yet capable of using oars, as Bauleahs, &c." Paras. 22, 24, 25 Report, 15th September. In his Letter of the 3rd December, however, Mr. Prinsep states—that "the wood boats from the Roymungul, told him that they saved three days in their trip;" yet he adds, "I myself reached Huseinabad by the old route in 2½ flood and 2 ebb-tides, and returned by the new passage in 3 floods;" thus himself, by experiment, finding

the time longer by the new route, instead of being three days shorter, as represented to him. Col. Galloway conceives, therefore, for the reasons assigned in his minute, that the work can in no way be made to realize the original intentions of Government ; that the Circular Canal is part of the original plan, and as such, has consequently lost its originally anticipated value, and that the very large outlay, amounting, it is believed, to several Lakhs of Rupees, still required for that part of the work alone, cannot be compensated by any advantage which its completion could yield, especially as the communication with the East side of the Town is already completed, and the passage to the Great River, existing by Tolly's Nullah, if cleared of boats, as it may easily be by imposing an additional Toll on such as remain in it beyond a given time allowed for passing, is better, more speedy, and otherwise preferable, to any that can be obtained by means of the Circular Canal, encumbered as it is to be by locks, and after all leading but a little way, till it must fall into the old route through Tolly's Nullah ; to say nothing of the possible danger of injury to the Navigation of the Hoogly, to the Drainage of Calcutta and to a portion of the Town from irruption of the river. He accordingly recommends, that the work be entirely suspended.

5th. The accompanying copy of the minutes recorded by the individual members of the Board, will better explain the views, which we have severally taken of this important work. We beg to submit them for the consideration of Government, and to solicit such orders as your Honour in Council may be pleased to communicate, for our guidance.

We have, &c.

(Signed) T. ANBUREY, *Chief Engineer,*
 „ A. GALLOWAY, *Lt. Col. Member Military Board,*
 „ D. McFARLAN, *Chief Magistrate, & Mem. M. B.*
 „ JOHN CRAIGIE, *Lt. Col. Mem. M. B.*

The accompanying original plans received with Mr. Prinsep's report above referred to, to be returned to this office, when no longer required.

(No. 16, to No. 25. inclusive, omitted.)

No. 26.

To THE SECRETARY TO THE MILITARY BOARD.

SIR,

In compliance with the request contained in your letter of the 15th January last, I have the honor to forward, for the information of the Military Board, the accompanying two Statements, shewing the number of Boats, which have passed through Tolly's Nullah during the last official year from May, 1829 to April 1830.

I have the honor to be,

Sir,

Your most obedient servant,

CALCUTTA,
 COLLECTOR'S OFFICE,
 The 28th March, 1831.

(Signed)

C. TROWER,

Collector.

No. 26. a.

*Statement shewing the Number of Boats, Donguhs, [? Dingees] &c.,
passed through Tolly's Nullah, for the Official year, 1829-30.*

	Number of Boats, Dun- gas, [? Dingees] &c., passed through Tolly's Nullah.	Amount of Tolls levied.	
May, 1829,	1,301	3,365 10 0	
June,	1,724	4,824 10 10	
July,	1,805	4,310 13 10	
August,	1,757	4,579 1 5	
September,	2,040	4,317 0 5	
October,	2,256	5,477 5 0	
November,	2,559	5,579 3 0	
December,	2,921	5,796 11 0	
January, 1830,	3,477	6,688 0 0	
February,	3 650	5,839 10 10	
March,	3,346	8,319 1 5	
April,	1,622	4,604 4 17	
Total Boats,	28,458	*66,401 7 2	* ₹ 63,701 7 2 —J. M.

CALCUTTA ; COLLECTOR'S OFFICE,
23th March, 1831.

C. TROWER,
Collector.

No. 26. b.

*Statement shewing the Number of Boats, laden with Firewood, passed
through Tolly's Nullah, for the official year 1829-30.*

	Number of Boats.	Quantity of Firewood as per koot.	Amount of Tolls.
May, 1829,	27	24,609	246 1 10
June,	107	1,90,500	1,905 0 0
July,	80	79,334	793 5 10
August,	101	1,16,474	1,164 11 15
September,	99	86,477	864 12 5
October,	130	1,05,439	1,054 6 5
November,	212	1,69,033	1,690 5 10
December,	212	1,55,635	1,556 5 10
January, 1830,	180	1,22,723	1,227 3 15
February,	251	1,73,629	1,736 4 15
March,	235	1,39,510	1,395 1 15
April,	241	1,29,832	1,298 4 0
Total Boats,	1,875	14,03,195	14,931 14 10

CALCUTTA ; COLLECTOR'S OFFICE,
28th March, 1831.

C. TROWER,
Collector.

(No. 27. omitted.)

No. 28.

No. 306.

To CAPTAIN GAVIN YOUNG,

Secretary to the Military Board.

SIR,

I had the honor to receive your letters, Nos. 1325 and 1403 of the 22nd and 29th March respectively, while in attendance upon Lt. Col. Tickell, Superintendent of Public Works, in his visit of inspection to the Mofussil Canals. We had, therefore, the opportunity of making personal enquiries on the points referred to us by the Military Board; and it was satisfactory to find, that the information thus gathered on the spot, agreed with the deductions already made.

First.—With regard to the number of Boats of various descriptions passing by the old Sundurbun and new Canal routes.

2. The accompanying statement No. 1, shews, that the average of Boats traversing the Bhamunghatta end of the Canal line from September to March inclusive, has been 177 per diem; this average at first sight appears very large; but it comprises a large proportion of the smallest description of saltees and dingees used by the fishermen and wood cutters,—one-third of the number, say 60 Boats per day, would more fairly represent the actual Navigation in Boats of burthen, passing the whole line of Canal.

3. Colonel Tickell and myself met several large Bhudrakhoolia Boats, returning from Calcutta to the Eastward empty, which, upon enquiry, proved invariably to be exploring the new Canals for the first time; which proves the utility of the route is hardly yet known to the generality of traders. The Koolna pilot, in attendance upon the Colonel's Budgerow, also, was not aware that it was Navigable for Boats of such dimensions. For the last month or two, the transit of Boats has been checked by the closing of the Bhamunghatta Cut, for the purpose of completing the excavations left unfinished last season; all these circumstances, would lead to the expectation of a considerable increase of the daily average hereafter.

4. Of the comparative navigation through the Tolly's Nala Route, I am unable to offer any correct information. Upon application to Mr. Collector Trower for a copy of the Toll Register of Tolly's Nala and of the Entallee Canal, I learnt that these documents* had already been laid before the Board, which will, therefore, be able to draw its own comparisons. I may beg leave to remark, that the Collector's Register may be expected to be *underrated*; while in the register kept by my people, the *contrary* error may possibly have been committed, from a misconceived desire to enhance the importance of the Canal Works. Should it be the desire of the Board to possess more accurate information on the subject, I will place trust worthy peons, at proper places, to keep registers for a month or other prescribed period.

Secondly. 5. The Board desire to know the comparative time occupied by boats of various descriptions using sails or oars, in passing by the Old and New routes. On this head, I beg leave to refer to the accompanying sketch No. 2, of the two routes from Calcutta to the Eshamuttee River, or the mouth of Good-lad's Creek. I have marked the points where, for moderate sized boats, it is necessary to pass at high water; and the run to be made with each ebb and flood, supposing there to be no wind, is expressed by dotted lines. The division of the Southern route admits of very little variation. Starting from Tarda with the ebb, boats of any dimensions are nearly sure of reaching Busuntpoor in two full tides: a light panswae, or good rowing boat, might even run down from the lake to Athara Banka

* See Nos. 26. a. and No. 26. b. at page xxi.—J. M.

in one ebb ; but (as we were informed by a panswace manjee who had performed this feat) it requires hard exertion at the oars.

6. Through Tolly's Nala, I presume, the only additional time required, setting aside all impediments from the crowded state of the Nala, would be *one flood tide* to run up to Gurryahat. Thus, as I stated in my annual report, three full tides will be sufficient for the old Sundurbun passage, and if favored by a westerly wind, it may be performed in two.

7. The Canal route, in ordinary circumstances, will occupy three full tides, because the strength of the tides is less, and in many parts, their direction opposes the progress of the boat ; because also, high water is necessary to enable boats of any draught exceeding one hath ($1\frac{1}{2}$ feet) to pass over the shallows of the Chullabarrya, Chytul, and Bayleygunj Canals ; one additional ebb is also required to perform the passage down the Eshamuttee to Good-lad's Creek, after reaching Hoseinabad—but this is equally demanded in the other route, since, although Busuntpoor is but a short distance above the mouth of Good-lad's Creek, the space can only be traversed with a falling tide, and the shoals, at the entrance of the Creek itself, would necessitate a detention there, until the return of the flood.

8. Boats of 900 maunds burthen, are now in the habit of passing through the Canal route eastward, in three full tides, without difficulty. Col. T's. Budgerow performed the return voyage in that time, taking the high water of the Bayleygunj Canal, as the starting point ; but there is this difference in the return voyage, that a tide must be lost by large boats in passing through the Hoseinabad Cut and Dansa Khal, at this season of the year ; since the lift of the Kullooar Gong tide, so far exceeds that of the Eshamuttee, as to produce a very strong current (east with the flood, and west with the ebb tides) through the Dansa Khal ; and there is, as yet, no tracking path along its banks to enable boats to stem it. They therefore pass the Hoseinabad Cut with the ebb, and anchor in the Kullooar Gong until half flood. The whole passage to Calcutta therefore occupies four tides in point of time : and to this might be added the flood necessary to bring the boat up the Eshamuttee, but as before remarked, this portion of time is common to both the Old and New routes.

9. With the assistance of a favorable wind, the time of passage may be very much curtailed, as the slackness of the Canal tide does not prevent progress being made against them. Thus I have traversed from the Mundaree Choumook to the Entallee Canal, in a Bauleah in one flood tide ; and I dare say the distance from Hoseinabad to Chytul, might be performed in a similar time, with an easterly wind : but it is hardly fair to lay any stress upon contingencies of such a nature.

10. Upon the whole, the Board will perceive that no time is gained under ordinary circumstances by the Canal route ; and that the advantages offered to navigation are, altogether, of another nature ; but I am not called upon, at present, to express my opinion upon any subject but that of the immediate questions referred to me.

I have the honor to be,

Sir,

Your most obedient Servant,

JAMES PRINSEP,

Superintendent of Canals.

CANAL OFFICE,
15th April, 1831.

No. 28. a.

No. 1.

Abstract of Boats Passing through the Bahminghatta and Bhogdigee Canal, according to a Register kept at the Kanta Tullah.

Boats Passing to Calcutta.

	Large Boats above 300 mds.	Pansway Boats.	Dingee Boats.	Saltee Boats.	Total.
1830.					
Sept.	391	367	1596	311	2665
Oct.	601	449	1945	549	3544
Nov.	537	533	1349	426	2845
Dec.	631	644	1578	566	3419
1831.					
Jan.	518	546	1252	601	2917
Feb.	319	378	483	599	1779
March,	371	502	550	666	2089
	3368	3419	8753	3718	19258

Average of Boats per month, 2751
 Ditto per day, 91

13th April, 1831.

Boats Passing from Calcutta.

	Large Boats.	Pansway Boats.	Dingee Boats.	Saltee Boats.	Total.	Grand total.
	619	410	1368	306	2703	5368
	356	248	852	229	1685	5229
	670	511	1462	658	3301	6146
	625	695	1663	609	3592	7011
	462	562	1144	618	2786	5703
	317	419	496	656	1888	3667
	355	661	526	659	2201	4290
	3404	3506	7511	3735	18156	37414

Average of Boats per month, ... 2593 Average per month, 5344
 Ditto per day, ... 86 Ditto per day, 177

JAMES PRINSEP,
 Superintendent Canals.

(No. 29. to No. 33. inclusive omitted.)

No. 34.

No. 2781.

FROM LIEUT. COL. R. TICKELL,
Superintending Engineer, Lower Provinces.

TO CAPT. G. YOUNG,

Secretary Military Board,

SIR,

Barrackpore, 19th April, 1831.

In compliance with the instructions of the Military Board, communicated in your letter* No. 363 of the 13th [18th] of January last, respecting the new line of Canals from the Esamutty River at Hoseinabad to Calcutta, I returned by that route to the Presidency for the purpose of inspecting it, accompanied by Mr. James Prinsep, who met me by appointment near Bissuntpore, on the evening of the 1st Instant. I had a large 16-oared Budgerow, drawing about three feet, and three office and baggage boats of 6 or 700 mds. each.

* See Index to Appendix to Appendix (H.) No. 3.

2. One tide is sufficient to take up a Boat from Bissuntpore, at the western extremity of Goodlad's Creek, to the entrance of the Bayley Gunge Cut, or by the old route through the Roymungul; but having been delayed nearly 3 hours at Bissuntpore, in endeavouring to extricate our grapnel, which had caught in a sunken boat, I did not reach Hoseinabad, the entrance of the new line of Canals, until 8 A. M. on the 2d, at about half ebb, which however carried us down, in the course of an hour, to the mouth of the Bayley Gunge Cut; the latter half of the ebb, running West through the Hoseinabad Cut and Dansa Khal.

3. About 9 A. M., reached the mouth of the Bayley Gunge Cut, the bed of which we found nearly dry, and remained there till 1 P. M., about $\frac{3}{4}$ flood; and proceeded at 2 P. M. through the Bayley Gunge Cut; and at $\frac{1}{2}$ past 2, entered that of Bowanypore, current against us, and obliged to track at 4 P. M. through this Cut; and the current being now slack, and no tracking ground, proceeded by luggeis, until $\frac{1}{2}$ past 5, when we entered the Akrotollah Khal with the tide in our favour, and at $\frac{1}{2}$ past 6 P. M. reached the end and anchored.

4. At 12, the same night, proceeded, and at half past 1 A. M. of the 3rd, stopped at the entrance of the Chytul Canal, the bed of which being high, we were obliged to remain there until $\frac{3}{4}$ flood or nearly so, when we proceeded at $\frac{1}{4}$ past 5 A. M.; got through in the course of an hour, and dropped down to Basserah or Choumoah at the Mundaree Khal, and waited there until 12 for the flood. At 4 P. M., entered the Chultabaryah Cut, which we got through at 7; at $\frac{1}{2}$ past 9, turned down the Kanta Khal, the Bominghutta Canal being closed for the purpose of completing the excavation, and at 11 P. M. reached Tordah, where we remained for the flood; and about 1 A. M. on the 4th, proceeded up the lake, and reached Ballyaghat at 5 A. M.; having thus made the passage in two days and a night, or nearly 60 hours, which, by all accounts, is about the same time that we should have taken by the old route through the Roymungul, that is, as far as Tordah, whence the passage through Tolly's Nullah would of course prove much more tedious than that up the Lakes, in consequence of its being always so much crowded with Boats.

5. With reference to the 3d paragraph of your letter under reply, I shall now proceed to describe the actual state of the new line of Canals, with reference to facility of Navigation, both for light and heavy Craft.

6. HOSEINABAD CUT.—The shallowest part of this Cut, is at the entrance towards the Esamutty over the remains of the Old Bund, where it is scarcely 2 feet deep, I understand, at low water; my boats, however, passed without difficulty, and we found from 6 to 7 feet water beyond it.

7. The ebb and flow are regulated by the Kullooar Gung, in the same manner as are the rise and fall of the Tide in all the other new Cuts, by the several Tide streams that intersect them, and which serve alternately as feeders and drainers, leaving the beds nearly dry in many places at low water, and at high water, affording ample depth for the passage of Boats of from 800 to 1,000 mds.

8. The velocity of the current in the Dansa Khal, exceeds that of any other point in the line, being between 5 and 6 miles an hour; sufficient to prevent any filling up. One or two stumps of trees require to be removed, and for which Mr. Prinsep gave the necessary orders on the spot.

9. The Board are fully informed of the unsuccessful attempt that was made in 1829, to bund off the Kullooar Gung, with a view of conducting the powerful ebb current which passes down the Hoseinabad Cut into the Bayley Gunge Canal, and which would have effectually prevented any deposits of silt in either. The Board are also in possession of Mr. James Prinsep's Reports as to the expediency, or otherwise, of making another attempt, the advantages of which, he appears to think, would not prove commensurate with the difficulty and expense of such an undertaking, and recommends that the new Navigation be allowed to remain as at present, a system of tide passages—at least for a year or two, when a fair criterion may be formed of its success; in which opinion, as well as I can judge from the little I have seen of the Canals, I fully concur; for the new line under any circumstances, I conceive, will only be adapted for light craft, that is, for boats not exceeding 1,000 mds. tonnage.

10. **BAYLEY GUNGE CANAL**—The sandy spit or ridge in the centre, is completely dry at low water, and the Eastern extremity nearly so, which was not excavated last season to the full depth by 2 or 3 feet;—at high water, however, there is always a depth at the shallowest part of 6 feet, sufficient for the passage of boats drawing not more than three Hots. Several stumps of trees in the Hinchee Khal to the Westward, are now being removed, and the tracking path continued down to the mouth of this Khal.

11. **BOWANY GUNGE CANAL**—Like the former, is shut up, at low water, the ridge of sand in the centre, being then left dry. The Bayley Gunge and Bowany Gunge Canals being so near each other, Boats can easily pass through both, with one flood Tide; the current in the latter is slack, tracking therefore becomes necessary at all times.

12. **CHYTUL CUT**—Has deepened considerably since it was opened, from the strong set of the Seeldah Gunge Tide through it; and although it was never fully excavated, it does not appear necessary in consequence, to incur any further expense in completing the intended section; it is of course dry at low water in the centre, and like the Bayley Gunge and Bowany-pore Canals, can only be passed at $\frac{3}{4}$ tide, or high water, when there is a depth of from 7 to 12 feet. From the position and distance of this Canal from those to the Eastward, and the loss of more than half a tide in passing through the Bayley Gunge and Bowany-pore Cuts, a separate flood tide must be devoted to this passage, for all, except very light boats, and nearly a whole ebb Tide is consumed in running down a distance of only $1\frac{1}{2}$ miles to the Mundaree Khal or Choumoah.

13. **CHULTABARYA CANAL**—Forms the Western extremity of a series of natural Khals running from the Choumoah, and can therefore be reached in one flood tide; a boat here brings the tide with it, and the tracking path admits of its being carried on through the slack water, till it finds the ebb at the Doodbeebee Khal, which carries it to the mouth of the Bojdiggee Canal—these three form, in fact, but one Canal. There are several shallows in the artificial Cuts which are dry, or nearly so, at low water—one in particular, which was caused last rains by a slide of the banks to the extent of about 500 feet, a little to the West of Bunjur Haut. The removal of this impediment would of course render it necessary to close the navigation of the new line for a month or six weeks, but there being still a depth here of $4\frac{1}{2}$ or 5 feet at high water, it does not appear necessary, at present, to incur any further expense

on it. From the Choumoah to these shallows, is a distance of 12 miles, which perhaps is too long a run for deeply laden craft; this disadvantage, however, is partly obviated by the power of applying the Goon, as it lies through a country free from jungle, and from the length of the line, the rise and fall of the tide is reduced about 3 feet, which maintains, it is said, a sufficient depth of water to keep Boats drawing 2 Hots afloat, during low water, except at the places above mentioned; no Boat therefore of larger draft should attempt to pass, unless sure of making its way through in one tide. The Doodbeebee Khal, in the centre of these Canals, and bunded as it is from the access of the tide from below, forms a convenient reservoir, or feeder to the Chultabarya and Bhojdiggee Canals, and is the main cause of the little difference of the tide level observable in them.

14. **BAMINGHATTA CANAL**—This is now closed for the purpose of completing the excavation of last year at the East end. The section of this Canal, Mr. Prinsep states, has hitherto suffered nothing, having indeed been only open for one season; it was observed that previous to closing it, the tide set through from the Kantatalla, so that one cause of its expected deterioration is thus removed, but the current is very sluggish, and the water of the Sunderbund Creeks, both here and throughout the whole line of the Canals to the Esamutty, abounds with silt, contrary to the expectations at first entertained.

15. The Channel through the Lakes, appear to maintain ample depth for boats of all sizes, and indeed by a natural operation, it deepens in section, and the rapidity of the current increases in proportion as the banks or bunds on its sides, become covered with vegetation.

16. I observed that the mouth of the Eastern Canal at the upper end of the Lake was much blocked up by a deposit, which, I was informed, proved too hard for the dredgers at work in this Canal; and it may perhaps be necessary to excavate this by bunding and chowka work. I have accordingly called on Mr. Prinsep for a plan and estimate.

17. From the foregoing observations, the Board will perceive, that the new line of Canals is adapted only to the navigation of light* boats, to which it affords, I conceive, a communication preferable to that by the old route through the Sunderbunds—in the first place, by avoiding the Roymungul and other dangerous points of the lower Channel; secondly, the small depth of water in which they would be immersed in the event of meeting with an accident, so that the boat and cargo are comparatively secure; and thirdly the frequent occurrences of cultivated country and villages on the line, instead of the continued jungle, which is met with along the old route.

18. In point of time, little or nothing, is to be gained except perhaps by boats which can row against tide, the ebbs and floods being all much more gentle than in the great Sunderbunds; the time of transit therefore, may be considered on a par with that of the lower line, although the distance traversed is so much shorter.

19. The line of Sunderbund Canal is open both to Tolly's Nulla and the Lake exit, and so far may be considered apart from either of these. The preference must be given to the Lake route by fish boats, and all in fact, bringing goods to the Calcutta market, as it will enable them, by means of the Eastern and Circular Canal, to land their cargo in the very Town. The remainder, including heavily laden boats, resort to Tolly's Nulla, I conclude, either for the purpose of passing through into the Hoogly, or to deliver their freight in the neighbourhood of that stream; the Eastern Canal not affording, at present, a sufficient depth of water for the larger boats. But it is impossible, as yet, to judge which of the two routes will be most frequented, until the Circular Canal is completed and opened to the river; when it is but reasonable to expect, that the new one will attract most of the craft now

* That is, Boats up to 1000 mds. burden—but Boats used in the transport of the produce of the Country, will adapt themselves to the circumstances of the Navigation, in the same manner, as smaller vessels came more generally to frequent the Port of Calcutta in preference to larger vessels, as being more suitable to the Navigation of the Hoogly, and the Commerce of the Country.—J. M.

passing through Tolly's Nulla, which will then most probably be used only during the period of the rains, when the Chitpore Locks will be closed against the Navigation for two or three months.

20. Having thus briefly noticed the various impediments that exist in the several new cuts, there remains but little further to be said of the facility of navigating through them along the new line, which appears to be as fully and freely navigable now, as it can well be made, for the passage of boats not exceeding 1000 mds. burthen; and by the registers kept by Mr. Prinsep, it seems to be used and preferred by them; it is consequently, so far, of considerable public utility, and the expense of maintaining it so, does not promise to be incommensurate with such a beneficial result.

I have, &c.

(Signed) R. TICKELL, *Lieut. Col.*
Superintending Engineer, Lower Provinces.

No. 35. and No. 35½. omitted.

No. 36

No. 316.

TO CAPTAIN GAVIN YOUNG,

Secretary to the Military Board, &c. &c. &c.

SIR,

I have the honour to acknowledge receipt of your letter No. 1720, dated 21st ultimo, informing me that the Estimate No. 332, for deepening the Balya Ghat Canal, had been passed by Government.

2. The advanced state of the season will oblige me to postpone this work until after the rains, as it would be very inconvenient now to close the Dhurmtulla drains.

3. In anticipation of the Board's orders, I have cleared away the deposit from the mouths of the Bythukhaneh and Narkooldungah drains, and I have further to report, that, the Canal is now open to the drainage of the town as far North as the Ultahdungah division. I subjoin for the information of the Board, a table of the levels of the several Drain-floors referred to the zero or average level of the Salt Water Lake, as fixed by the late Superintendent.

4. Through the unskilfulness of the head bricklayer, some of the Drains at first constructed, were made higher than I intended, but as they all allow a sufficient slope from the Circular Road Drain floors, I have not thought it necessary to alter them.

I have the honour to be,

Sir,

Your most obedient Servant,

JAMES PRINSEP,

Superintendent of Canals.

OFFICE : SUPERINTENDENT CANALS,

4th May, 1831.

No. 36. a.

Levels of the Town Drains towards the Circular Canal, above or below the Lake zero.

Name of Drain.	Level of Sill or Floor.		Slope of the floor of the Tunnel drains.		Slope from the Circular Road to the upper mouth of the Tunnels.		Fall from the Circular Road drains to the zero or average level of the Canal.				
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.			
<i>Bytukkaneh Drain—South.</i>											
Sill of Masonry at the Circular Road,	+	5	9½	}	5	4	}	5	9½
Ditto mouth of Tunnel,	+	0	5½	}	4		8½	
Ditto discharge of ditto in Canal, ..	—	5	2		..		..	
<i>Bytukkaneh Drain—North.</i>											
Sill of Masonry Circular Road, ..	+	5	8½	}	4	1	}	5	8½
Ditto mouth of Tunnel,	+	1	7½	}	5		7½	
Ditto discharge into Canal,	—	4	0		..		..	
(curved to)	—	5	5)								
<i>Narkuldungah Drain—South.</i>											
Sill at Circular Road,	+	2	3¾	}	0	6	}	*2	3¾
(Soil filled in 1½ feet above Sill,)									
Mouth of Tunnel Drain,	+	1	10	}	3		4	
Discharge of ditto,	—	1	6?		..	..			
<i>Narkuldungah Drain—North.</i>											
Sill at Circular Road,	+	1	4¾	}	0	3	}	*1	4¾
(Soil filled in 2 feet above Sill,)									
Mouth of Tunnel,	+	1	2	}	1		4	
Discharge of ditto,	—	0	2		..	..			
<i>Maniktola Drain—South.</i>											
Sill at Circular Road,	+	3	1½	}	3	6	}	3	1½
(1 foot of Soil above hard earth,)									
Mouth of Tunnel,	—	0	4½	}	2		3	
Discharge of ditto,	—	2	7½		..	..			
<i>Maniktola Drain—North.</i>											
Sill at Circular Road,	+	3	4	}	1	10	}	3	4
Mouth of Tunnel,	+	1	6	}	1		11½	
Discharge of ditto,	—	0	5½		..		..	

Here in the rains the tide in the River rises as high as the road.

At Ooltadanga the River rises, 1½ feet higher than the Circular Road Street.—*Captain Schach's Memoir.*

* The real slope of these Drains is greater by two feet; the Sill of the Circular Road drain bridge being unnecessarily deep.

J. PRINSEP,
Superintendent Canals.

No. 37. a.

No. 318.

FROM JAMES PRINSEP, ESQ.

*Superintendent of Canals.*TO LIEUT. COL. TICKELL, *Engineers.**Superintendent of Public Works, &c. &c. &c.*

SIR,

Calcutta : 5th May, 1831.

I feel at some loss to answer your reference, under date the 22d ultimo, regarding the relative advantages of the new Mofussil Canal routes, from my having devoted but little attention to the subject, beyond what might be necessary in the course of my operative duty, of bringing the several works to completion. The expediency, or otherwise, of Major Schalch's scheme, I looked upon as already set at rest by the former opinions of experienced officers and the determinations of Government, founded upon them.

2d. Against the success of such a scheme, it might have been argued at first, that a free and commodious water passage already existed through the Sunderbuns, possessing the facility of tide-ways, with an ample depth of water, not liable to diminution by deposit, and having merely the inconvenience of passing through deep and dangerous jungles, in which the frail boats of the country, were occasionally exposed to accidents.

3d. The traffic by this route had, for a long period, been very considerable, in spite of these dangers, so great as to yield a large revenue to Government, through the Toll at Tolly's Nullah. If the new cuts were proposed to add to the security and facility of this extensive navigation, apart from any view of actual pecuniary benefit, this object has certainly been gained; the total expenditure upon them, being,* in fact, a trifle compared with the revenue already derived from Tolly's Nullah and the Entallee Canal.

Rs. 2,00,000.

4th. In point of speed, the result has proved, that no advantage should have been calculated upon; especially, while the route eastward of the Juboona, lay through Good-lad's Creek; and from Major Schalch's Memoir, it does not seem, that he set much upon changing that route, which he states to be very commodious, and not to have deteriorated since it was first opened.

5th. But the security to light craft (and to boats from the up country in particular) from travelling through water, so much more tranquil, and of less depth than former Channels; affording also, commodious tracking paths, and ground for making fast at night, instead of being obliged to anchor in the middle of impetuous streams; and last, though not least in real utility, the convenience of meeting with villages and markets throughout, are positive advantages of the new route, to which those engaged in the navigation are becoming every day more sensible.

6th. The distance to be travelled, is likewise much curtailed, although the passage may occupy the same, or even a longer interval, than that by the lower Creeks; it is also, for a considerable distance, nearly straight, so that when the wind is favourable, progress against tide is more facilitated, than it would be from the same cause below.

7th. The points of communication with cultivated country, are also multiplied, so that the produce thereof, may be shipped and brought to market at a cheaper rate than heretofore; and it may fairly be expected, that the opening of the Canals, will accelerate the clearing of all the jungle lands, lying any where contiguous to them.

8th. Judging from the registry of boats passing through the new Canals, their success might be pronounced complete, and *ceteris paribus* what other test could be imagined of so

practical and conclusive a nature? But there is this difference, between the two routes, viz.—that the new one has cost two lacks of rupees: to make a fair comparison therefore, a Toll, equivalent to this outlay, should be established, and the number of boats then registered and compared with the present rate.

9th. It is hardly good, in argument, to assume that a Canal must be useless where river conveyance is to be had close by. I need not call to your remembrance the opinion current among Engineers in Europe and quoted by Mons. Dupin,—“*that rivers were but created to become feeders to Canals, at least in an advanced state of civilization.*” This view of the question is not quite suitable to the Canals of the Sundurbuns; it would be more so, were the present series of tide-ways cut off from the Sundurbun streams, by powerful bunds: and I have already expressed my opinion to the Board, that the system of short cuts would be materially improved, by transforming them into one or two continuous Channels, which would give them more of the condition of a real Canal; but it remains a question, whether, this or any other expensive measure, could be compensated by pecuniary benefit to Government; and this is the ground upon which I have ventured to recommend, that the further extension of Major Schalh's scheme should be suspended.

“Force commercial, de G. B.”

10th. That there are advantages from the Mofussil works, even in their present state, I hope, I have succeeded in proving; while I have granted, not only, that they were far from being indispensably necessary, but even far from fulfilling the expectations of their originator. They are too much effected by the rise and fall of the tide; they are *liable* to choke up gradually from sand-oozings, deposit of silt and sliding of banks; they throw the salt-water of the Sundurbuns upon the cultivated land of Chultabarya, and render* the formerly sweet water of the Juboona unfit for irrigation; they cannot be made into a single Canal line, on account of the vast depth of the Mundaree Choumoo; or into two lines, without the expensive measure of bunding the Kulloor, Gobra, and Kantatulla streams.

11th. On the other hand, they have opened a convenient passage through cultivated country; they are finished as far as they go; they have not cost much; and they will remain serviceable for a long time at a trifling occasional expense.

12th. I believe I have brought forward, impartially, all of the arguments which strike me, for or against, the Mofussil Canals, and I do not conceal, that my opinion is opposed to the principles advanced by their originator. The new cuts do not stand in the same light as the Coxalee Khal or Good-lad's Creek, or as Morrison's cut in the Burra Kooleya. Both of these shortened and improved the eastern route wonderfully; and Tolly's Nullah did so in a more especial manner, by opening the connection with the Hoogly so close to the metropolis.

13th. I concur fully in Mr. Schalh's observations on the subject of the latter Channel, which is certainly not adequate to cope with the augmented inland traffic of the port.

14th. A second and more commodious communication was called for, and setting aside the cost of the land, no site could have been more judiciously chosen, than that of the present *Circular Canal*; but this question is distinct from the subject of your present reference.

I have, &c.

CANAL OFFICE:
5th May, 1831.

(Signed) J. PRINSEP,
Superintendent Canals.
(True Copy.)
(Signed) R. TICKELL,
Superintending Engineer, L. P.

* The opening of the Hoseinabad Canal into the Essamuttee River, must have had the same effect on the water of that River, as the opening of the Circular Canal has had on the water of the River Hoogly, which has not been attended with the serious evil as was at one period apprehended.—J. M.

No. 38.

Minute by LIEUT. COLONEL GALLOWAY, on the Papers marked No. 36. and No. 36. a. of this Appendix.

It appears by this report of Mr. James Prinsep on the drains opened into the Circular Canal, dated the 4th instant, that only the drains of three streets, viz.—Bytuckhana (or Bowbazar Street), Narkeldanga, and Manicktollah, have as yet, been opened into the Canal.

It also appears, that at the Circular Road, the bottoms of the Calcutta drains are in level, above the Salt Water Lake, as follows;—

				Ft.	In.
Bytuckhanah,	{	South drain above the Lake,		5	9 $\frac{1}{4}$
		North	Ditto Ditto,	5	8 $\frac{1}{2}$
Narkeldanga,	{	South Ditto Ditto,		2	3 $\frac{3}{4}$
		North	Ditto Ditto,	1	4 $\frac{3}{4}$
Manicktollah,	{	South Ditto Ditto,		3	1 $\frac{1}{2}$
		North	Ditto Ditto,	3	4

If these levels be correct, it is manifest that by admitting the River into the Canal to the above heights, respectively, an entire stop commences to the drainage of Calcutta by these drains. But in the rains we know, that the River rises more than 12 feet above the Lake, and consequently, upwards of 6 feet above some, and about 9, 10, 11 feet above others of those drains; and that in the rains, the River instead of being as high as the sills or bottom of the drains at the Circular Road, at the Bowbazar, the River if let in, would rise as high as the street itself; and at Ooltadanga the River rises 1 $\frac{1}{2}$ feet above the Circular Road street.—*Captain Schalch's Memoir.*

It appears, Mr. Prinsep states, that through the unskillfulness of the head Bricklayers, some of the drains at first constructed, were made higher than Mr. Prinsep intended; of these drains, I observe, some are made to discharge their contents into the Canal on a level with the water in the Canal, when that is equal with that of the Lake, some upwards of 5 feet below that level.—I cannot help expressing my surprise and astonishment, that a matter of so great importance, as the construction of drains on which the health and comfort of the inhabitants of this city so materially depend, should have been left either to the skill or unskillfulness of any such person as a head Bricklayer. It is impossible that the board, can rest satisfied with such a report as this: I propose therefore, that Government be requested to assemble a Committee of Engineer Officers and others, who may have a knowledge of the drainage of Calcutta, to examine and report on those drains; and upon the effect which the Circular Canal is likely to have on the drainage of the city; and to point out what means they may deem most advantageous, for securing at all seasons of the year, if practicable, that indispensable object.

16th May, 1831.

(Signed) A. GALLOWAY.

No. 38 $\frac{1}{2}$.

[*Minute by D. McFARLAN, Esq. Dated 16th May, 1831, on the Papers marked No. 36 and No. 36. a.*]

I do not think it will be necessary to apply for a Committee, though there can be no objection whatever, to send the communication noticed, to Colonel Tickell for report.

In Mr. Prinsep's letter, there were two points that seemed to require my attention as Chief Magistrate—one, whether it would be necessary to lower the mouth or Western end of the Tunnel emptying itself into the Canal on the North side of the Nurkeldanga Road ; the other, whether the floor of that drain at the Circular Road was too low or not.

I need not trouble the Board with the lengthened enquiry this has given rise to, especially as the two points are not yet completely settled. I am pretty confident, however, that the sill of the drain alluded to by Mr. Prinsep, cannot be safely raised, and the floor of the Tunnel will have to be lowered, not as a matter of necessity but of convenience and expediency.

The fears mentioned in Colonel Galloway's Minute, are founded upon the assumption that the River water is to be let into the Canal.—But that is not intended, except in such regulated quantities, as may, from time to time, be considered desirable for the purpose of causing a current through the Canal.

Supposing we have locks for the transit of Shipping* at all times, the quantity of water let into the Canal at any given time, would be so small, as when spread over the whole length, not to be sufficient to rise the general level in any important degree, which again would be soon compensated by water let out of the Canal, as Craft passed into the River.

The Canal has not interfered with the Marhatta Ditch to the North of Mutchwa Bazar Road.

(Signed) D. McFARLAN.

No. 39.

No. 299.

To THE HON'BLE SIR C. T. METCALFE, Br.,

Vice President in Council.

HONOURABLE SIR,

We have the honour to submit for the information of Government, the annexed copies of Reports* by Lieutenant Tickell and Mr. J. Prinsep, dated the 15th and 19th ultimo, and 5th instant, communicating further particulars relating to the construction of and the advantages derivable from the Circular and Mofussil Canals.

2. With reference to an observation at the close of the 19th Paragraph of Lieutenant Col. Tickell's Letter, as there appears to be some misapprehension, we shall draw his particular attention to the Plan of "Gates" proposed by the late Captain Prinsep in his Memoir of October 1827, and request him to consider in concert with Mr. J. Prinsep, whether that Plan still appears preferable to any other,* and whether a system of Canal locks, and admitting of the egress and ingress of Craft from and to the River at all times, might not be devised and carried into effect without materially enhancing the cost of the work.

3. On receipt of his reply, we shall again address Government on this point.

We have, &c.

(Signed) THOMAS ANBURY, *Col., Chief Engineer.*

„ A. GALLOWAY, *Lt. Col., Mem. Military Board.*

„ D. McFARLAN, *Chief Magistrate, & Offg. M. M. Bd.*

17th May, 1831.

„ JOHN CRAIGIE, *Lt. Col., Mem., Military Board.*

* See original.
J. M.

* See Nos. 28, 34,
36, 37, a.

* See Index to Ap-
pendix to Appen-
dix (H) Nos. 41.
86. 95, a. 97. 98. 99.
99, a. 99, b. 99, b.
102. 103. 104. 105.
106. 108, a. 148, a.
150.

(No. 40 to No. 53 inclusive, omitted.)

No. 54.

To JAMES THOMASON, ESQ.

Deputy Secretary to Government—Judicial and Territorial Department.

SIR,

We have the honour to report that the progress of the excavation of the Circular Canal is about to obliterate some portions of the old Marhatta Ditch or Chitpore Nulla, laid down as the legal boundary of the Town under a Government Proclamation,—an Extract of which accompanies, and the verbal description of which as relates to the present subject, may be said to be between the mouth of the Nullah and the Bridge at the commencement of the Dum-Dum Road, as is shewn in the accompanying sketch.

2nd. It appears to be very desirable not only that what is the actual limit of jurisdiction should not be uncertain and undiscoverable, but that it should not be a fictitious line or a mere line on paper, but something substantial, not liable to pass out of men's memories or to be insensibly encroached upon by neighbouring inhabitants. Hitherto the Marhatta Ditch has been an excellent limit, but when parts of it are filled up, it can no longer afford the same security that embarrassing legal questions may not arise regarding the actual limit of the Town.

3rd. To provide against this eventual inconvenience, any of the [following] three Plans may be adopted—1st. A wall may be erected on the site of the old boundary—2nd. Small drains may be kept up, shewing the old Channel—or 3rd. The jurisdiction may be extended to the Canal: we shall say a few words in a general way, upon these plans.

4th. The old Chitpore Nullah or Ditch being no longer required for a drain, becomes the property of Government, and so much of it as borders on the ground already bought for the Canal, may of course be annexed to that ground, and disposed of in common with it: what is not contiguous may be sold to or exchanged with the nearest proprietor, but if the ground were thus given up to private individuals it would be essential to secure the permanence of the boundary. Nothing short of a wall or a ditch or drain to be considered a public work, would secure this object; for supposing one individual to purchase the land on both sides of the line, what authority would there be to prevent him building over the line, and effectually confounding the limit.

5th. It is to be considered, however, whether Government would build a wall, or order a smaller ditch to preserve the present Northern boundary, or extend the jurisdiction at once to the Southern bank of the new Canal, under the provisions Chap. 84, of the 55 Geo. III.: were the latter course followed, nothing would be required to be done to preserve the memory of the Marhatta Ditch or Chitpore Nullah; individuals would take care of their own boundaries.

6th. There would be other advantages in that course, the Canal would be a much better public boundary, both for purposes of Police and for the prevention of Smuggling, the small strip lying between the Canal and the ditch would be an awkward adjunct of the Chitpore Thanna.

7th. In considering of this question, it is however proper to mention that there is, as indicated in the accompanying sketch, a small strip of land, the property of Cassinauth Gangolee,* which would thus be brought within the limits of the Town, but the spot is extremely limited, and we have learnt in a general way, that the proprietor will not object to this ground being made subject to the jurisdiction of the Supreme Court.

8th. We have communicated with Mr. Master, who sees no objection to the latter arrangement.

* NOTE.—The Spots noted as being the property of Madhub Soor & others have been purchased by Government.

9th. A reference to the sketch will shew that if a wall be built, it will be a crooked boundary, and somewhat expensive: it might be dwarf, say 3 feet high, the mere purpose of a public boundary, but it would need to be higher if considered as a barrier.

10th. As against the plan of extending the boundary, we should mention the objection that it would subject part of the godowns about to be erected upon the banks of the Canals, to the jurisdiction of the Supreme Court, which whether an evil or a good, would be inconvenient as placing one portion of the Mercantile Community frequenting the Canal under a different system of law and judicature from the remainder.

11th. It is to be considered also, that there must apparently be provided Drainage for the proportion of ground lying between the edge of the Canal and old jurisdiction of the town. The banks of the Canal will necessarily be raised, and the shed [? flow] of water will be Southward, and may be inconvenient unless an outlet be provided on the site of the old ditch; and it would be quite possible to fill up the ditch to a great extent, and yet leave a superficial conduit for drainage. Thus the old bridge at the commencement of the Barrackpore Road may be taken as the apex or highest point:—Surface Drains might commence there, leading Southward to the Canal and Westward to the River, both deepening as they reach the ultimate point.

12th. Upon the whole, this last will probably be the better plan, though indeed it will not be so economical as that of extending the boundary, seeing the site of the present Marhatta Ditch will require to be kept free for the maintenance of the new Surface Drain. It will moreover be no security against Smuggling.

13th. We have thought it necessary to enter into this detail, because we are the natural conservators of the boundary, which is unquestionably about to be seriously affected by the progress of the Canal, and has already been so, and because we feel, that in a choice of plans so nearly balanced in respect of their advantages, the decision of Government is necessary.

We have the honor to be, &c.

(Signed) D. McFARLAN, *Chief Magistrate.*

„ W. C. BLAQUIERE, *Magistrate.*

„ P. ANDREW, *Magistrate.*

CALCUTTA POLICE OFFICE, „ A. S. L. McMAHON, *Magistrate.*

2nd Nov. 1831. „ C. K. ROBISON, *Magistrate.*

No. 54. u.

Extract from the Proclamation relative to the Limits of the Town of Calcutta, dated 10th day of September, 1794.

The Northern Boundary is declared to commence, and does accordingly commence, on the West* side of the River Hoogly at the Post or Mete No. 22. Situated at the North Point of Colonel Robertson's Garden, called Jackapore, immediately opposite to the North of the Brook called Chitpore Nullah or Baugbazar Nullah, and the said Northern Boundary is from thence declared to continue and is continued accordingly by a line drawn across the River from the aforesaid point to the South corner of the mouth of the said Nullah into the Post or Mete No. 1, near the foot of the Chitpore Bridge, and from thence by a line drawn Easternly, and passing the South end of the said Bridge to No. 2, and from thence along the South side of the said Nullah or Brook to the Post or Mete No. 3, and thence into the Post or Mete No. 4, passing the Old Powder Mill Bazar, until it reaches the foot of the Bridge leading to Dum-Dum where the Post or Mete No. 5 is.

[? * East.]
J. M.

(Signed) D. McFARLAN, *Chief Magistrate.*

(True Copies.)

(Signed) H. C. WATTS, *Head Clerk and Accountant.*

No. 55.

(No. 1687.)

To D. McFARLAN, ESQ.

And the other Justices of the Peace for the Town of Calcutta.

Judicial Department.

GENTLEMEN,

I am directed by the Honorable the Vice President in Council to acknowledge the receipt of your Letter, dated the 2nd instant, on the subject of the Northern Boundary of the City of Calcutta.

2nd. To remedy the inconvenience which might result from the obliteration of the Marhatta Ditch forms the present Northern Boundary, and is on the point of being filled up by the earth excavated from the new Circular Canal, you propose one of three expedients.

First,—That a wall be erected on the site of the old Boundary.

Second,—That small Drains be kept up shewing the old Channel of the Marhatta Ditch.

Third,—That the Canal be constituted the future Boundary of Calcutta.

3rd. To the latter course several objections exist, to one of which yourselves have adverted in Paragraph 10 of your Letter, independently of these, the measure to be effectual should be immediate, whereas the course in question under the terms of the Act of Parliament (Chap. 84, of the 55 of George III.) requires the sanction of the Court of Directors and Board of Commissioners, and therefore involves the delay of a reference to them.

4th. From Paragraph 4 it would appear, under any circumstances Drains are requisite either on the site or in the immediate vicinity of the present Marhatta Ditch. The construction of a wall is not therefore an alternative proposition, but if authorized at all, must be additional to the Drain.

5th. The terms of the Proclamation appear to the Honorable the Vice President in Council to point out the most convenient method of marking the Boundary. A Drain may be constructed as nearly as possible identical with the present Boundary, and Posts or Metes erected at the points where they formerly stood, or if they are obliterated, as near the old site as can now be ascertained, or at such points as are most convenient, so that straight lines may be drawn from one post to another. For durability, the Posts or Metes should be constructed of masonry and distinguished by appropriate inscriptions, marks or numbers.

6th. For the execution of this measure, His Honor in Council is prepared to sanction such moderate expenditure as may be found necessary.

7th. The Map which accompanied your Letter is herewith returned.

I am, &c.

COUNCIL CHAMBER:
The 8th November, 1831.

(Signed) J. THOMASON,
Deputy Secretary to Government.

(True Copy.)

(Signed) H. C. WATTS,
Head Clerk and Accountant.

No. 55½.

Extract—Military Board Proceedings of the 22nd November 1831.

RESOLUTION.—Ordered, that copy of the Chief Magistrate's Letter, together with copy of the 5th Paragraph of Mr. Deputy Secretary Thomason's Letter therein referred to, be transmitted to the Superintendent of Canals, requesting* that he will execute the work therein described for permanently marking out the line of the old Marhatta Ditch, and to forward a bill for the expense to this Office.

* See Index to App.
to App. (H.) Nos.
64, 68.

(No. 56. to No. 83. inclusive omitted.)

No. 84.*

No. 2259.

FROM LIEUT. COLONEL R. TICKELL,

Superintending Engineer, Lower Provinces.

TO CAPTAIN G. YOUNG,

Secretary Military Board.

Canals.

Barrackpore ; 7th February. 1832.

SIR,

I have the honor to transmit the undermentioned Abstracts and Accounts of the Canal Office, from James Prinsep, Esq, Superintendent of Canals for the season 1830-31. together with his report upon the operations of the Department during that period, under date the 31st of December last.

Bill No. 247, for completing the Baminghatta Canal, from December 1830 to July 1831, amounting to Sicca Rupees 2,385 : 6 : 9¼.

Bill No. 248, for Levelling and making Tracking-path along the Banks of the Baminghatta and Bhojediggie Canals, from November 1830 to June 1831, amounting to Sicca Rupees 817 : 14 : 7.

Bill No. 249, for expense incurred upon the Dredging Boat No. 1, employed at the Entally Canal from Koodghatta to Salt Lake, from 1st December 1830 to 30th April 1831, afterwards within the Circular Canal, amounting to Sicca Rupees 1,616 : 15 : 5.

Bill No. 250, for expense incurred upon the Dredging Machine No. 2, employed at the Entally Canal from Koodghatta to Salt Lake, from 1st December 1830 to April 1831, and from May to 30th June 1831, cutting the Bunds of the Circular Canal, amounting to Sicca Rupees 1,787 : 14 : 3.

Bill No. 251, for expense incurred in excavating the Circular Canal from 1st December 1830 to 30th June 1831, amounting to Sicca Rupees 59,184 : 0 : 2¼.

Bill No. 252, for expense incurred in Bunding and excavating the Entally Canal at the confluence of the New Circular Canal, amounting to Sicca Rupees 917 : 9 : 5.

Bill No. 253, for expense incurred in re-excavating Lots Nos. 42 to 44, length 307 running feet, near the Bytaconnah Bridge ; and removing soil deposited from the Drains, during the rains of 1830, amounting to Sicca Rupees 511 : 8 : 4.

Bill No. 254, for expense incurred for Bunding and re-excavating Lots Nos. 2 to 4, length 293 running feet, near Nuffkooldanga Bridge, and removing soil deposited from the City Drains, during the rains of 1830, amounting to Sicca Rupees 871 : 7 : 6.

Bill No. 255, for the original cost of various tools, pumps, &c. purchased for the Mofussil and Circular Canal works, at various times, and not entered in the Canal Bills, showing the loss by wear and tear, up to 30th June 1831, amounting to Sicca Rupees 7,679 : 8 : 7½.

Appendix (A) General Abstract of expense on Mofussil Canal works, for the season 1830-31, from 1st July 1830 to 30th June 1831, amounting to Sicca Rupees 10,996 : 12 : 2¼.

Appendix (B) General Abstract of Circular Canal works, for the season 1830-31, from 1st July 1830 to 30th June 1831, amounting to Sicca Rupees 91,351 : 4 : 2.

Appendix (C) List of Lots excavated in the Circular Canal, showing the expense incurred in excavating the same.

Appendix (D) List of outstanding balances on account of the Mofussil Canal up to the 30th June 1831, amounting to Sicca Rupees, 4,159 : 1 : 7½.

* Transmitted with its enclosures to Government on the 3rd of April 1832. See Paper marked No. 85, of the Index to Appendix to Appendix (H) and the Reply of Government marked No. 90, of the same Index — J. M.

Appendix (E) List of Boats passed through the Baminghatta New Canal, from September 1830 to December 1831; and through the Tolly's Nullah, from July to October 1831.

One Plan of the Dum-Dum Bridge.

2nd. The several items of the Bills have been examined, and are on the whole, as moderate as could possibly be expected in a work of this nature.

3rd. Annexed, I also transmit a copy of Mr. Prinsep's Letter No. 380, of the 7th ultimo, received with the above documents.

4th. The account current, that accompanied these Papers, has been forwarded to the Deputy Accountant General for adjustment.

5th. In returning to the Presidency last month, I came through the Mofussil or Eastern Canals, and found them in very nearly the same navigable state as when I passed through in April last, since which period the Baminghatta Canal has been completed and thrown open.

6th. There are still, however, many roots and stumps of trees in the Hoosynabad and Baley Gunge Canals, and in the Dansa Khal, which, from the strength of the current in those Channels, particularly in the latter, render the Navigation difficult and dangerous to large, or heavily laden Boats, I would therefore recommend that a stout Boat be applied for from the Harbour Master's Department, to be employed in removing these obstructions, as suggested in the 13th Paragraph of Mr. Prinsep's report, there being none, it appears, attached to the Canal Department, stout enough for the purpose.

7th I lately examined the works on the Circular Canal, accompanied by Mr. Prinsep; and fear that it will be impossible, except at an enormous expense, to keep open the Navigation, if the City Drains be allowed to empty themselves into it as at present—(see the 20th and 26th Paragraphs of Mr. Prinsep's report.) All that can be done at present, I conceive, is to try the effect of an artificial Dam and weir, [? wear] at the mouths of all these Drains, as proposed by Mr. Prinsep, and, should they fail, the Drainage of the City must be conducted into the Lake by some other* Channel. The Special Committee of Engineer Officers, lately ordered to report† on the state of the Circular Canal, having already so fully reported on this and every other point connected with the undertaking, that I have nothing further at present to add on the subject.

8th I beg to recommend that Mr. Prinsep be allowed to dispose, of the unserviceable stores and tools adverted to in the 35th Paragraph of his report, when the prime cost of the remainder may be brought to credit under the proper head.

* ? Like that suggested by Colonel Forbes, See Appendix (D.) page 180.—J. M.
† See Papermarked No. 101.

No. 84 a.⁽¹⁾

Annual Report on Canal Operations 1830-31, Mofussil Canals.

In my Report to the Canal Committee, dated 15th September 1830, I made the following estimate and Scheme of Mofussil works, for the ensuing season.

1. Two Dredging Boats to be employed on Bunds,	6,600
2. Contingencies on removing Bunds by hand,	800
3. Levelling and making two paths along the Bahminghatta and Bhojdiggee Canal,	1,500
4. Deepening the Moonpritt Khal and removing roots of Trees,	1,200
5. Cleaning jungle and making path along the Mundaree, or Sealdah Khal,	1,000

11,100

2. The Statements, now forwarded, differ somewhat in the items brought to account, but agree nearly in amount with the total estimated outlay for the year, as will be seen by reference to Abstract No. 1.

3. As I had the honour to submit a Report upon the general state of the Canals after the rains of 1830, and the Board were also pleased to call for a general report upon every point connected with them from the Superintending Engineer, Colonel Tickell, after his visit in April last. I feel it unnecessary to enter upon any questions of a general nature in my present Report, and shall confine myself to an explanation of the items entered in the yearly account.

4. The Dredgers, instead of being employed as was contemplated, in the Bhaminghatta Canal, were, for the chief part of the season, retained at work upon the Entallee Canal, and after the opening of the Circular Canal, were found necessary in the latter for the removal of the bunds, which could not be reached by hand. Their employment in this way was attended with a considerable falling off in the work executed; for the Dredging Boats having to be brought back to their station by a guy rope, after cutting the breadth of the bund, lost one-half of the day in shifting their place, and the mud Boats having to convey their load to the Lake, a distance of three miles through a Channel crowded with Boats, could not make more than one trip a day each; thus, the number of Boats filled per diem was reduced to 3, whereas it used to be 6, and even 8, while working in the soft deposit of Chingree Ghatta: with less work it was evident a smaller complement of labourers could keep pace. I therefore re-

1 Dredging Boats.

Former Establishment	Present Establishment.
4 Classies at 6 Rs. per month	24 2 Classies at 6 Rs. per month
2 Manjees at ditto, ..	12 2 Manjees at ditto, ..
7 Ditto at 5 per ditto, ..	3 8 Ditto, at 5 per ditto, ..
31 Dandies at 4 per ditto, ..	13 12 Dandies at 4 per ditto, ..
40 Coolies at 4 per ditto ..	16 20 Coolies at 4 per ditto, ..
	367
	272

duced the establishment both of Coolies and Dandies, as the marginal note will prove, so that although in the present season one Dredger has been supplied with a new Boat, and the other with a new set of buckets and chain,

the total expense incurred falls short of the average of former years.

5. Since June the other Boat also of the Old Dredger having become altogether unserviceable has been replaced by a new Boat at a cost of Rupees 175; but the machinery, (with the exception of the buckets,) is now in a very worn out condition and it will be necessary to make up a new chain immediately.

6. I was last year disinclined toward the maintenance of such frail and expensive machines, but the experience of the last rains has taught me, that Dredgers of some sort will be indispensably necessary to remove the soil deposited annually in front of the Town Drains, and until the Department can be put in possession of more effective engines, the present must be retained in a state to do the work

7. The Bhaminghatta Canal was bunded in January at the East, or Kantatulla mouth, to complete the excavations, which had been interrupted by the rains of 1830, as stated in my Letter to Major Jackson, (274) 3rd December 1830. It was found that the small Khal to the East of the Canal required to be both widened and deepened, and that the Dredger could not effect these objects with half the cheapness or ease of manual labour; several side bunds were found necessary and the oozing of water in various directions was so continual as much to impede the progress of the excavations. I measured the work on the 16th June 1831, and ascertained that 659, Chowkas had been cut, but that the bed of the newly excavated part for a space of 500 feet had not the same depth, by one foot, as the remainder of the Canal. This was not of much importance from the proximity of the spot to the *Kuntatulla* mouth, towards which a sufficient current sets with every Tide to deepen the Channel: the expense incurred was 2,385:6:9½. The

2. Bhaminghatta Canal

piles of the mouth bund being too firmly fixed to be extracted by hand, were removed after the rains of 1831, by the Chain frame winch of one of the Dredgers.

8 The good condition of the Bhaminghatta Canal is maintained in part by a cut, opening from the Eastern Salt Lake at the centre of the Northern Bank of the Canal; a strong ebb runs through this cut, setting alternately to the West and to the East as the Tide of the Tarda Nala or Kantatullah takes precedence in charge [? change] of level, this alternation of direction prevents, in some measure, the formation of a bar, at the entrance of the lake stream; but still the Canal has evidently, shoaled in that place, and the natural effect of its continuance will tend thus to separate the two halves of the Canal; on the other hand, the current improves the remainder of the Channel, and maintains a higher level of water during the ebb: the balance of good or evil is I think in favor of the former, and therefore I see no reason to recommend that a bund be thrown across at the point in question.

3. Tracking path

9. Along the Southern Bank of the Bhaminghatta Canal, a broad serviceable Road has been made by levelling the earth of excavation as contemplated in last year's scheme; the line was continued for a part of the way along the Bhojdigee Canal, but finding that there was already a Road sufficiently good for the remainder of the way, I did not deem it worth while to continue the work, and I consequently discharged the establishment of Road makers in March 1831.

4 Sealdah Tracking path.

10. On my visit to the Chytlul Canal, I found that the Zemindars had already constructed a small bund along the East margin of the Sealdah Khal; that work also was considered as unnecessary.

5 Bayleygunge Canal

11. In the Bayleygunge Canal, I confined my attention, as proposed to the clearance of the Moonprit Khal, where a number of roots and trunks of trees impeded the Navigation; and to cutting away a projecting point of land at its confluence with the Gobra Khal.

12. The circumstances of this Canal, on my last visit, appeared little altered; the jungle has grown up thick upon the Banks, thereby inconveniencing the towage, but it may be cut down annually at a small expense, the Boat people complain that this Canal presents more difficulties than any of the others, but it has ample water as yet at the top of the flood.

13. On my last visit to this quarter, I perceived a Boat staked or snagged by a protruding trunk of a tree, at the small Khal leading to the West end of the Hosunabad Canal, there are a number, of such dangerous obstacles in the minor Sunderbund Creeks, forming part of the Canal line, which ought to be removed, but as there is no Boat belonging to the Canal Department, stout enough to be employed on such a duty, it might be advisable to apply for the assistance of some Boat from the Harbour Master's Department, during a limited time, to clear the Channel in Akratulla and other dangerous places.

6. Chultabarya Canal.

14. In my last Report, I stated that a portion of the Banks of this cut, for a space of 500 feet had given way and slidden into the Canal, thereby diminishing the depth of water to 4 and 4½ feet at high-water, this evil has, in some measure, continued along the Bank towards Bhungunhat, and is likely to prove of serious detriment to the concern; the earth when dry appears to be hard and sound though somewhat sandy, but when immersed in water, it suffers speedy disintegration; at first, I imagined that this might be caused by its containing a large portion of salt, but I was surprised to find that it yielded very minute traces thereof on analysis; whereas the earth from the Bhojdigee Canal Banks, which maintain their form well, yielded nearly one per cent. of salt, and in fact the earth of excavation from this Canal is carried away by the Molungees for the extraction of this Mineral.

15. It might be possible to preserve the Chultabarya Canal Banks by staking, but the expense would be considerable, the earth deposited is easily taken up by the dredging buckets, and if a constant establishment of Dredgers is to be maintained, one may be detached upon this duty occasionally.

16. For the ensuing season, I have to submit no scheme of Expenditure upon the Mofussil Works, such small operations as I have ventured to propose, may be comprehended in an annual contingent bill.

17. Having since my last annual report addressed the Military Board, in reply to questions, relative to most of the subjects connected with this Canal, I have no general remarks now to offer, except such as are explanatory of the items in the accompanying accounts: indeed, since the Board have been pleased to appoint a Special Committee of Engineers to report upon the present and prospective state of the Canal, it would seem superfluous in me to trouble them with my own opinions, had I any thing to say in addition to what is already before them in the several Memoirs and reports of my predecessors.

7. Circular Canal.

18. To proceed, therefore, in the order of the Statements of Expenditure.

19. The excavations of the past year have been chiefly of the unfinished lots of the last and former years, and the rates have consequently been enhanced by all the additional expense of bunding, baling water, and working below 18 feet or in the lowest Chowka; the new excavations comprise seven lots in Ooltadanga Division four in the Chitpore Division, one near the Barrackpore Bridge, and one at the confluence with the Entallee Canal, having jointly a length of 1,610 feet; the actual rates of digging during the past year have been reduced considerably, as I ventured to anticipate: my contracts with the Sirdar Coolies were made uniformly at, for the

8. Canal Work.

First Chowka,	Rs. 1 4 0	instead of Rs. 1 6 0
Second Ditto,	1 13 0	„ 2 0 0
Third Ditto,	2 8 0	„ 2 12 0

and the rates upon excavating by daily labour were even a trifle less than the above, but the effect of these reductions is overcome in the general bill by the high charges for contingents; thus in one place, (Ooltadanga lots 56-57) much extra expense and trouble was incurred first by the flooding of the works by an unexpected torrent from the city Drains in March, and again by the bursting of two springs in the bed of the Canal before the excavations were quite completed. To Drain the Chitpore basin, (as proposed in the last year's report, Paragraph 48,) a cut was opened through the Marhatta Ditch into the River, the deepening of which and the putting up an old pair of Flood-Gates caused a contingent charge of about 400 Rupees. More than two million cubic feet of water were drawn off through this sluice, so that it was infinitely preferable to baling: again, when the excavations recommenced in the Chitpore basin, it was remarked that a considerable rise of the bed ($2\frac{1}{2}$ feet) had taken place in lots 13 to 15, partly from the oozing upwards of the sandy bottom, and partly from the washing in of the Banks. The re-excavation of this portion is included with the rest in the finishing of the neighbouring lots, 15 to 27. Lots 3, 4 and 5 of the Sealdah Division, and lots 42, 43 and 44 South of Bythukkhanah Bridge, were re-excavated in like manner, the average deposit of soil during the rains having been nearly 4 feet: for these works and for the extra work at the mouth and in the Entallee Canal, separate bills were drawn up, under the authority of the Board, dated 15th January 1831.

20. During the rainy season just elapsed, the quantity of soil deposited in front of the main city Drains, ascertained by soundings taken on the 26th October, has been even more discouraging; so that at low-water the lightest Boats could not pass the Norkooldanga

or Maniktolah Bridges; the Dredgers were set to work to cut a Channel, but all that they

DEPOSIT.

	Length.	Depth.
Bythukkana Drains in all	1,000	2 to 3
75,000 cub ft.	1,000	3½
Sealdah Drain do. 210,000,	1,000	
Nurkuldanga Drains ditto,		
288,000.	1,000	4 to 5
Maniktola ditto, (including		
ditto, 120,000) last		
year.	600	3 to 5½
Oultadanga Drain ditto,		
195,000.	500	1

9. Bridges.

effected in the month of September was obliterated by a single hard day's rain in October. They are now again at work upon the same places; but from the delay of continually repairing the Boats and Machinery, their progress is far from satisfactory.

21. *Barrackpore Bridge* stands first in the list, but the greater part of the expense of its construction was charged in last year's bills. The masonry executed this season, including plastering, stone-work, &c. (amounts to 1,500 Rs.) making the total cost of this Bridge, exclusive of the iron-work, Rs. 13,732 : 11 : 11.

22. The Roads of approach on either side required a breadth of 50 feet, to be laid with two bricks and 6 inches of khooa to put them on a par with the rest of the Road; the charge on this account has exceeded Rs. 2,000, being at the rate of 5 : 4 : 0 per 0/0 cubic feet of pukka work, this includes the raising of the kucha Road on both sides, ramming, levelling, &c

23. The *Oolta Dunga Bridge* was sanctioned by Government, on the 17th May 1831, just in time to allow the foundations to be laid in before the rains; about two-thirds of the masonry are built, and there will be no difficulty in finishing the superstructure, when it shall be deemed expedient to complete the Bridge. The expense incurred was Rs. 5,364 : 9 : 2½, being at the rate of 18 : 1 : 2¼ per 0/0 feet; a part must be considered as extra, on account of the bursting of a spring under the foundations on the East side.

24. *Dum-Dum Bridge*. The foundations of this Bridge were laid upon a scale, somewhat exceeding those of the Barrackpore Bridge, as it had occurred to Captain Baker and myself, that a foot more of breadth to each of the carriage-ways would be desirable; when the walls had been brought up a foot or two above the level of the Tracking-path it was brought to our notice that the heavy artillery carriages and guns traversing from the arsenal to Dum-Dum, could not pass over a Bridge similar to that just erected on the Barrackpore Road, without great risk of injury to the piers and even to the single chains supporting the Roadway; we accordingly deemed it expedient to substitute a single Bridge of double the breadth, with double chains, and very substantial piers capable of resisting all accidents. The lower masonry was somewhat decreased by this arrangement, but saving in this respect may probably be balanced by an increased charge for beams and chains. More effectually to guard against the effect of shocks and strains upon the standards, I requested Captain Baker to introduce rollers under the suspending links, and I also took the precaution of laying the courses of brick at right angles to the pressure, and of placing the Suspension points well back upon the piers. But I am perhaps premature in alluding to these circumstances as the accompanying bills only bring up the masonry even with the floor of the Bridge.

25. The *Manicktola, Nurkuldanga, and Bythukkana Bridges* appear in the Abstract chiefly on account of the pukka Roads made from them to the Circular Road. The greater part of these Roads might perhaps have been more properly constructed by the Judge and Magistrate of the Suburbs, but that Officer having expressed himself unauthorized to undertake them without a reference, while the raised portion of the Roads near the Bridges was necessarily to be constructed by the Canal Department, having also people and materials at hand; I therefore did not hesitate to complete the whole line to the Circular Road, in the case of the Manicktola and Nurkuldanga Roads: the Bythukkana Road, being of greater length and a serviceable pukka Road, was merely repaired as far as the slope of the approaches extended. The remainder has since been repaired by the Magistrate.

See Plan of this Bridge transmitted with the present Report.

10. <i>City Drains.</i>	
Bythukkhana Road	2 Drains
Sealdah,	
Na kuldang	
Manicktolah, ..	2 ..
Since such was ad-	
ed Ooltadanga	
Drain,	1 ..

26. In the Letter, which I had the honor to address to the Board, dated 4th May 1831, I reported the completion of the eight main Conduits, discharging the Drainage of the City into the Canal at the places noted in the margin ; and gave a statement of the levels and slopes of their floors, &c. : the total cost of them has been Rs. 12,400, (exclusive of one Narkuldanga Drain, brought into last year's account, but inclusive of a portion of the *Dum-Dum Drain* still incomplete) this is at the rate of 16 Rs. per 0/0 cubic feet, including digging and filling earth, &c.

27. If I am permitted to offer an opinion upon these Drains, I should say, judging from the effect of last season, that they afford too easy a vent for the Drain water ; which consequently carries a large quantity of suspended matter with it into the Canal, instead of depositing it in the Drains themselves, whence it could be easily removed as usual by the scavengers of the Town : as a proof of this, I may adduce the circumstance of the Bythukkhana South Tunnel Drain ; it is contracted at its mouth by an old pukka Bridge, from the floor of which a pukka slope or weir [? wear] was made to prevent the water from cascading at the mouth of the new masonry ; the deposit in front of this Drain appears to have been much smaller then elsewhere, while the Drain above is a good deal filled up with soil : on the other hand, in the deeper Drains the water found such ready exit, that its velocity was increased sufficiently to corrode the bed and sides of the kucha Channel, and to undermine many of the walls and Bridges situated along its course.

28. I should propose, therefore, trying the effect of an artificial dam and weir [? wear] at the mouths of all or some of these Drains. The damage they are, in their present state, likely to do to the Canal, calls urgently for a remedy.

29. Up to the date of the present Abstracts, the Canal Road operations were chiefly confined to the removal of the piles of excavated earth from the Banks, so as to leave a clear space of 70 feet in breadth, of which 30 were destined for the kucha Road or quay, and 40 for the pukka Road, with its side Drains. Since July the latter has been completed on the Town side of the Canal, from the South extremity to the Manicktolah Bridge, along with the dressing and grassing of the Bank and the construction of small water-courses, at distances of 400 feet apart, along the whole line, has been completed as well on the East as on the West side of the Canal.

30. The outlay upon the removal of earth, &c. has been 9,717 : 8 : 5 $\frac{1}{4}$, to be included in the Road account, in addition to the sum of 208 Rupees charged in the last year's Abstract.

31. I have in most places avoided expending money in conveying the earth to unnecessary distance, but, in some places, in order to level the spare ground for lease or sale, a trifling addition to the contract rate, for extra carriage and spreading of the earth, has been incurred.

32. The level of the Canal Road is in most places raised several feet above the surrounding country, so as to form a complete protection against the possibility of the water flooding the Banks, even supposing the communication with the River to be made permanent throughout the rains.

33. The Lowest part is in the Ooltadanga Division, where there was a comparative scarcity of earth. In the immediate neighbourhood of the Manicktolah Bridge, it may be advisable to bring earth from a distance of 5 or 600 feet to raise the ground and protect the Road, if not to fill up the tanks purchased near it ; in other places, where excavations have been made for bricks, it will eventually be necessary to convey earth from a small distance, to fill the pits.

11. Canal Road.

34. The yearly Abstract does not exhibit the amount or cost of the bricks fabricated : but the rates of these and other materials are furnished in a separate six-monthly Statement. On the 5th October 1831, I received orders from the Superintending Engineer to apply for supplies of lime from the lime Agent at Silhet, but this was too late to be available until next season. For the Lock-Gates, I have deemed it better to lay in a supply of kunkur to be burned in kilns on the spot, as this cement is much better adapted for under-water work. The number of bricks made

Statement.

26 Lakhs burned with wood at			
298 : 5 : 0 per Lakh,	7,972	6	3
5 Ditto ditto coal, at 329 : 12 : 0			
per ditto,	1,501	12	0
5 Ditto purchased from Captain			
Baker at 577 : 15 : 0 per do. 1,930	11	8	

last year was 31,28,236 lakhs (or kilus) at an average price of 302 : 13 : 9 per lakh, besides 5,10,790 lakhs purchased from Captain Baker, because made on the Banks of the Canal and inconvenient for him to remove, while their presence prevented the completion of the Canal Roads.

Stores and Tools.

35. The accounts current of the Canal Office have been uniformly debited with a considerable sum, as invested in tools and stock, instead of charging their cost upon the works, at their first purchase ; which, as they are mostly of a perishable nature, would have been more convenient. The greater part of the Fowras and other implements are at present quite unserviceable, some being worn out, some broken, some corroded with rust from the damp (particularly the files and carpenters' tools,) and others lost or taken away by the coolies, or held by them in pledge for unsettled balances with their sirdars. I have made out a list of all the articles included under the head of stock, and have collected them in the Nurkuldanga Sircar's Godown. I would suggest that all such as are unserviceable should be sold off at once by Auction, with or without a Committee of Survey, as the Board may deem proper. The prime cost of the whole, less the proceeds of the sale, may then be brought to credit, under the head of Tool Contingent for Canal excavations, as they chiefly belong to that branch of operations.

Outstanding Balances.

36. In last year's report, I classed the Outstandings into such as were recoverable and such as were desperate, but refrained from recommending any balance to be struck out until further efforts should have been made for its recovery. In the present year some balances have been realized by decrees of Courts, a few also by amicable arrangement, and some by collections made under the Sirkar of the Bhavanipoor's Division : the Bayleygunge balance is all paid up ; that of Chytul will be adjusted shortly. The Sirkar of Bhavanipoor was killed in the late fracas with the Moolavces, and I fear that it will be needless to look for any further realization of balances in that quarter.

37. In the present system, no arrears can be easily incurred by the sirdars, as the first advances are made on a limited scale, and the subsequent payments are kept a little short of the progress of the work done.

Cash Balances.

38. The Balance of former assignments to my debit, on the 1st July 1830, was 63,200 Rs., which I at the time imagined would suffice for the operations of the season 1830-31, I was, however, obliged to apply on the 17th April 1831, for a further assignment of one lakh, which was granted on the 4th June ; on the 1st July 1831 the cash balance in my favor at the Treasury was Rs. 80,000, of which, up to the present time, Rs. 30,000 have been drawn : it will be time enough to look for a fresh supply, when the remaining Rs. 50,000 shall be nearly expended.

I should remark that since 20th December 1830, the salaries of the Canal Superintendent and establishment, and the several contingents, have been paid out of the funds in my hands, as also the monthly expenses of the Dredger's bills for Mofussil works, &c., so that although the assignment is stated to be for the Circular Canal, it is really destined for general purposes of the department.

40. The only reduction made under this head has been by the discharge of the head Sircar of the Chitpoor Division (16 Rupees), two Chuprassees (10), and one weigher (5), in all 31 per mensem; one extra Chuprassee has been retained to keep a register of the Boats passing through the new Canal route.

Establishment.

41. With regard to the agreement between the actual Expense and the original Estimates for the Circular Canal, I am hardly yet prepared to speak: but as the excavations have drawn nearly to a close, I may state in general terms, that a considerable saving has been effected, or which is the same thing, much more work has been done at the same Expenditure. Thus the original Estimate set forth that the Canal should be dug to an average depth of 16 feet, making a total of 45,000 Chowkas, at a total expense of 1,14,777 : 8 : 0, whereas 45,000 Chowkas have been dug (the average depth being 19 feet) at a cost of Rupees 1,06,921 : 6 : 0, leaving a surplus of Rupees 7,856 : 2 : 0 to complete the 5,000 Chowkas next to the River.

See Appendix (C) Estimates.

See Appendix (C.)

42. Of the Rupees 3,50,000 sanctioned for the Circular Canal, Rupees 2,02,155 : 14 : 2 have been expended. I am not clear whether the estimate was intended to include the cost of the iron work of the Bridges, it might have been more convenient to have passed Captain Baker's bills through my accounts, that a comprehensive view might be formed of the whole.

43. Altogether, I trust it will appear to the Board that the Accounts are very reasonable and much within expectations, considering the impossibility of my giving more than a general superintendence to this branch of the duties of my Office: I have strictly adhered to the Plan of seeing every payment made and entered into the books of the Office before myself, signing every such entry and every voucher of contingent charges.

44. I believe I have now alluded to all the items of the present Abstracts: I abstain, from lengthening my report by any scheme of operations for the ensuing season, since it is obvious that I have merely to complete the works now in hand. Moreover, I have submitted separately my suggestions for some modification in the construction of the Lock-Gates. In conclusion, I beg leave (in connection with the Canal works) to notice, that in the course of the present year, I have published from Surveys nearly prepared by my late brother, a map of the Salt Water Lake, and the Suburbs of Calcutta, comprising also a general map of the Mofussil Canals, and a table of levels. I have set the Surveyor also to work upon a large map of the surplus ground on the Banks of the Canal now available for sale or lease, but I regret to say that the illness of Mr. Turner has greatly retarded its preparation.

Map.

(Signed) JAMES PRINSEP,
Superintendent Canals.

CANAL OFFICE: CALCUTTA MINT,
31st December. 1831.

(No. 84 a.⁽²⁾ and No. 84 a.⁽³⁾ omitted.)

Expense of Excavating Circular Canal.

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor		
			Length.	Mean Breadth.	Depth.					
From Nurkuldangah to Saumbazar.	1830-31.	1	100	86 0	19 6	167,700 0	230 0	395 7 6		
	"	2	94	92 6	18 4	140,437 4	192 10	324 8 3		
	"	3	100	87 6	18 11	222,790 10	305 11	540 11 3		
	"	4	100	90 0	18 7					
	"	5	106	89 0	19 8	185,535 4	254 8	433 6 7½		
	"	6	101	88 6	19 8	175,790 6	241 2	409 2 6		
	"	7	102	86 0	18 3	161,551 0	221 9	364 8 6		
	"	8	100	86 4	19 3	164,291 0	225 5	377 5 9		
	"	9	102	88 6	18 11	168,392 3	231 0	385 15 10½		
	"	10	98	91 6	19 8	176,351 0	246 13	418 14 3		
	"	11	105	88 6	19 5	189,925 4½	260 6	435 2 10½		
	"	12	106	88 6	18 9	177,539 3	243 8	403 9 4½		
	"	13	100	87 6	18 10	165,976 8	227 10	378 7 7½		
	"	14	93½	92 6	19 2	165,767 8½	227 6	382 7 6		
	"	15	100	87 6	19 6	240,247 2	329 9	570 10 7½		
	"	16	100	91 0	18 3					
	"	17	104	88 0	20 0	183,440 0	251 9	427 9 10½		
	"	18	103	91 6	19 6	184,277 0	252 11	425 13 7½		
	"	19	101	89 6	19 10	179,783 5	245 9	418 11 6		
	"	20	99	85 0	19 9	131,701 3	180 10	320 12 9		
	"	21	101	89 6	18 3	155,721 10	211 10	362 13 1½		
	"	22	99	89 6	18 3	166,753 1½	228 11	382 4 10½		
	"	23	110	90 0	19 4	186,480 0	255 13	432 5 3		
	"	24	104	90 6	18 6	167,466 0	229 7	374 12 3		
	"	25	100	91 0	17 8	161,266 8	221 2	361 0 0		
	"	26	97	89 0	18 0	152,094 0	208 11	310 13 0		
	"	27	105	92 0	15 7	159,512 6	218 12	352 1 10½		
	"	28	100	90 6	16 0	152,801 0	209 11	339 4 1½		
	"	29	93	87 6	17 5	125,948 1½	172 12	284 15 6		
	"	30	85	80 0	18 0	122,472 0	168 0	272 4 0		
	1829.	31	100	93 6	16 10	157,391 8	599 3	978 2 4½		
	"	32	100	93 0	16 11	157,325 0				
	"	33	70	91 0	19 2	122,091 8	691 15	1,173 14 1½		
	"	34	100	93 6	18 8	504,475 2				
	"	35	100	100 0	18 10	197 2	313 6 3			
	"	36	108	95 6	18 7			143,824 0		
	"	37	101	89 0	16 0	151 10	420 5 1½			
	"	38	107	91 0	18 10			183,170 0		
	"	39	95	90 6	19 1	166,468 8	228 5	380 9 0		
	"	40	104	89 6	19 3	174,904 0	139 14	404 8 0		
	"	41	102	94 6	18 6	183,121 6	251 2	413 0 3		
	"	42	100	92 0	18 0	328,104 0	450 0	748 13 6		
	"	43	106	91 0	19 0					
	"	44	100	91 6	18 3	166,987 6	463 0	751 8 1½		
	"	45	109	91 6	17 2	170,562 9				
	"	46	103	92 6	19 0	181,022 6	248 4	415 14 6		
	"	47	100	93 6	17 7	164,404 2	666 14	1,082 2 4½		
	"	48	100	90 6	17 9	160,637 6				
	"	49	100	92 6	17 5	161,104 2	448 8	780 11 9		
	"	50	100	91 6	18 9	335,784 0				
	"	51	98	88 6	18 10	435 6	722 9 7½			
	"	52	100	90 0	18 4			297,373 4		
	"	53	100	91 0	18 7					

No. 84. a. (1) — (Continued.)

APPENDIX C. — (Continued.)

Expense of Excavating Circular Canal. — (Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.		
			Length.	Mean Breadth.	Depth.					
From Nurkuldangah to Saumbazar.	1829.	54	104	90 0	17 5	155,820 0	213 11	347 12 3	Finished by daily work.	
	"	55	110	88 6	19 6	190,122 6	260 12	440 9 4½		
	1829 & 1831.	56	170	94 4	21 0	337,479 0	462 15	757 9 7½		
	"	57								
	"	58	127	88 6	20 0	124,790 0	508 14	851 10 1½		
	"	59	89	90 0	18 0	146,182 6		435 10 4½		
	"	60	97	89 6	21 0	182,311 6	250 1	419 11 1½		
	"	61	106	92 0	18 7	181,287 8	253 10	407 5 0		
	"	62	103	93 0	18 8	178,808 0	245 4	353 14 0		
	"	63	109	86 0	18 3	156,950 0	217 2	353 3 6		
	"	64	99	88 0	18 2	158,268 0	217 2	356 13 10½		
	"	65	100	91 6	17 6	160,125 0	219 10	390 5 10½		
	"	66	102	88 0	19 1	171,292 0	234 12	349 11 6		
	"	67	103	91 0	17 5	157,376 5	215 4	1,144 0 7½		
	"	68	100	88 6	18 10	166,675 0	695 13	310 6 9		
	"	69	100	88 0	18 10	165,733 4				
	"	70	100	87 6	18 2	174,854 2	641 8	1,066 2 1½		
	"	71	98	88 0	16 4	141,039 2				
	"	72	99	85 0	19 4	142,600 0	280 15	454 10 2¼		
	"	73	100	88 6	18 7	164,462 6				
	"	74	100	88 0	18 3	160,600 0	496 10	768 6 6		
	"	75	104¾	90 7½	22 0	208,845 0				
	"	76	100½	89 7½	20 0	362,040 2	273 14	428 12 0		
	"	77	99	89 7½	20 6					
	"	78	102	93 9	20 6	196,666 9	314 4	504 2 6		
	"	79	103	93 6	20 6	197,425 3	242 1	381 9 3		
	"	80	97¾	86 0	21 0	176,536 6	142 0	225 13 5		
	"	81	55¾	88 6	21 0	103,611 4	392 8	674 4 6		
	1829.	82	100	90 0	20 0	286,104 0				
	"	83	112	68 3	18 6	247 14	438 6 10½			
	"	84	100	93 0	21 0					180,720 0
	"	85	110	91 6	21 6	384,789 0	527 14	929 3 1½		
	"	86	100	91 0	20 6		489 15	849 5 3		
	"	87	114	74 3	20 0	357,084 9				
	"	88	100	74 3	20 0	389 11	663 8 1½			
	"	89	123	90 6	18 0					283,379 6
	"	90	100	92 6	18 3	231 15	380 6 4½			
	"	91	100	91 0	18 7					179,108 4
	1831.	"	80	17 9	21 0	29,820 0	40 14	64 3 3		
	1829.	92	100	87 6	19 0	489,697 0	671 12	1,103 9 9		
	"	93	100	90 0	17 10		544 3	950 14 3		
	"	94	104	91 6	17 10	396,737 6				
	"	95	100	90 0	2 0	296 6	522 0 3			
	"	96	118	87 0	20 6					215,957 0
	"	97	112	89 6	21 6	201,122 0	275 13	490 10 6		
	"	98	101	91 0	22 0	521,067 0	714 12	1,211 6		
	1829 & 1830.	99								
	"	100	258	92 10	21 9					
Average,			10,213½	88 10	19 0½	...	22,967 4	38,527 6 11½		

Average expense per lot of 100 feet long. — Chowka 225. — Rs. 377 4 0

No. 84. a.⁽¹⁾—(Continued.)

APPENDIX C.—(Continued.)

Expense of Excavating Circular Canal.—(Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.
			Length.	Breadth.	Depth.			
From Nurkuldangah to Entally Canal.	1829.	1	101 0	87 6	19 2	169,385 5	230 14	387 3 0
	"	2	100 0	90 0	18 4	165,000 0	} 660 3	1,080 7 1½
	"	3	100 0	91 0	17 8	160,766 8		
	"	4	93 0	92 6	18 1	155,561 10		
	"	5	100 0	98 6	17 10	163,175 0	223 12	364 14 1½
	"	6	104 0	92 6	17 8	169,042 0	239 10	387 13 6
	"	7	100 0	93 6	17 9	166,538 6	228 7	371 7 9
	"	8	101 0	87 6	18 5	169,764 9½	232 13	380 13 10½
	"	9	100 0	85 6	19 0	161,500 0	221 8	368 8 7½
	"	10	92 0	88 0	19 0	150,745 0	206 12	345 13 0
	1830-31.	11	105 0	88 6	19 5	180,429 4	247 6	417 4 10½
	1829-30.	12	90 0	88 6	20 3	161,290 0	221 3	371 13 10½
	1829.	13	104 0	87 6	19 6	173,778 0	238 5	398 4 6
	"	14	100 0	88 0	19 3½	165,333 0	226 11	379 12 3
	"	15	103 0	86 6	19 0	165,108 6	221 12	367 4 7½
	"	16	98 0	90 0	18 0	141,920 0	209 12	345 2 0
	"	17	104 0	90 0	17 9	169,034 0	231 13	377 2 1½
	"	18	104 0	92 6	19 4	185,986 8	255 2	430 14 6
	"	19	116 6	88 6	18 5	170,251 5	242 6	391 10 9
	"	20	120 6	87 0	16 0	169,336 0	232 4	369 3 7½
	"	21	101 0	86 6	17 4	150,232 8	206 2	332 12 1½
	"	22	120 6	87 0	18 6	197,126 9	270 6	445 5 0
	1830.	23	} 502 0	84 4	18 6	766,787 8	1,051 12	1,746 14 7½
	"	24						
	"	25						
	"	26						
	"	27	} 195 6	83 0	20 0	115,045 0	426 4	734 6 10½
	"	28						
	"	29						
	"	30						
	"	31	101 0	85 9	18 9	169,486 0	232 7	384 5 3
	"	32	101 0	82 9	18 6	156,895 8	214 9	352 9 1½
	"	33	} 211 6	83 3	19 0	344,954 0	473 3	789 10 1½
	"	34						
	"	35						
	"	36						
	"	37	387 0	85 0	21 0	843,955 0	1,257 9	1,870 14 1½
	"	38	} 329 5	85 0	21 0	798,671 0	1,095 9	1,718 8 9
	1830-31.	39						
	"	40						
	"	41						
	1830.	42	} 307 0	80 0	20 0	464,520 6	637 4	1,102 3 0
	"	43						
	"	44						
	"	45						
	1830-31.	46	202 0	94 0	21 6	405,340 0	556 11	940 1 9
	"	47	} 300 6	78 10	18 8	442,944 0	607 6	1,003 15 4½
	1830.	48						
	"	49						
	"	50						
	"	51	} 231 0	81 4	20 0	411,436 6	576 11	964 7 10½
	"	52						
	Average,	...	5,227 5	87 5	18 10½	...	12,388 0	20,282 8 11½

Average per lot of 100 feet long.—Chowka 237.—Ra. 388.

Finished by daily work—309½ Chowkas more than calculated, on account of deposit.

Ditto, 289 extra Chowkas.

No. 84. a.⁽¹⁾—(Continued.)

APPENDIX C.—(Continued.)

Expende of Excavating Circular Canal.—(Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.
			Length.	Breadth.	Depth.			
From Dum-Dum Road to Chitpore.	1831.							
	"	1	217 0	87 6	26 6	389,243 9	563 4	875 3 3
	"	2						
	1830-31.	3	306 6	86 0	20 5	538,162 6	738 5	1,174 13 4½
	"	4						
	1830.	5	79 0	93 6	20 6	111,776 0	153 6	284 8 7½
	"	6	100 0	92 6	20 5	165,210 0	226 11	394 2 1½
	"	7	100 6	85 0	19 0	166,868 9	228 13	378 14 6
	"	8	100 3	85 0	20 0	167,633 0	229 14	392 8 8½
	"	9	100 3	84 0	19 6	164,209 6	225 4	378 9 10½
	"	10	186 6	86 6	19 3	310,546 0	426 7	715 14 4½
	"	11						
	1831.	12	52 0	87 6	20 0	91,000 0	119 4	186 11 10½
	1830.	13	96 0	121 8½	20 0	232,680 0	327 2	567 14 3
	"	14	99 6	135 0	20 0	273,108 6	374 10	735 11 9
	1830-31.	15	197 6	145 0	21 11	627,616 0	887 15	1,795 3 3
	"	16						
	"	17	100 0	134 3	20 0	272,145 0	372 11	732 15 10½
	"	18	100 0	132 0	20 7	535,424 6	726 9	1,508 3 4½
	Basin.	19	96 0	134 0	20 0			
	1830-31.	20	295 6½	150 0	22 3	989,200 0	1,366 5	2,574 8 0
	"	21						
	"	22	100 0	118 9	22 0	1644,537 0	2,310 11	4,587 12 10½
	"	23						
	"	24	100 0	118 9	22 0	1644,537 0	2,310 11	4,587 12 10½
	"	25	100 0					
	"	26	100 0	118 9	22 0	1644,537 0	2,310 11	4,587 12 10½
"	27	102 0						
			Average.	Average.				
No. 1 to 100.			2,729 3½	111 1	20 4½	9,277 3	17,283 11 9	
No. 1 to 52.			10,213 3	88 10	19 0½	22,967 4	38,527 6 11½	
			5,227 5	87 5	18 10½	12,388 0	20,282 8 11½	
Floors of Straw Houses.			18,169 11½	...	...	44,632 7	76,093 11 8½	
			...	...	...	145 11	144 8 5½	
						44,778 2	76,238 4 1½	

SUMMARY.

Expende of Excavation of 18,169 feet 11½ inches in measure,

Chowkas,	...	...	...	44,778,	2	76,238	4	1¼
Contingent charges of all sorts, including establishment,...	...	...	...	...	...	30,683	2	0

Total Rs.

1,06,921 6 1¼

Being Rs. 2 : 6 : 2 per Chowka of 729 Cubic feet.

The estimated rate was Rs. 2 : 8 per Chowka.

CALCUTTA,
SUPERINTENDENT CANAL'S OFFICE :
7th January, 1832.

(Signed)

JAMES PRINSEP,
Superintendent Canals

(No. 84. a. ⁽⁵⁾ omitted.)

No. 84. a. ⁽⁶⁾

APPENDIX E.

List of Boats passed through the Balminghatta new Canal.

Boats passed to Calcutta.					Boats passed from Calcutta.								
	Months.	Large Boats.	Pansway Boats.	Pingree Boats.	Saltee Boats.	Total.	Large Boats.	Pansway Boats.	Pingree Boats.	Saltee Boats.	Budgetary and Pinnas.	Total.	Grand Total.
1830.	September.	391	367	1,596	311	2,665	619	410	1,308	306	—	2,703	5,368
	October.	601	449	1,945	549	3,544	356	248	837	224	—	1,686	5,229
	November.	537	533	1,349	426	2,845	670	511	1,462	658	—	3,301	6,146
	December.	631	644	1,578	566	3,419	625	695	1,663	609	—	3,592	7,011
1831.	January.	518	546	1,252	601	2,917	462	562	1,144	618	—	2,786	5,703
	February.	319	378	483	599	1,779	317	419	496	656	—	1,888	3,667
	March.	371	502	550	666	2,089	355	661	526	659	—	2,201	4,290
	April.	603	701	761	830	2,895	566	678	747	860	—	2,851	5,746
	May.	522	606	664	774	2,566	476	527	597	741	—	2,341	4,907
	June.	458	573	604	741	2,376	451	522	631	752	—	2,356	4,732
	July.	377	448	486	488	1,799	355	457	555	554	—	1,921	3,720
	August.	618	630	1,597	534	3,379	912	734	1,943	427	—	4,016	7,395
	September.	686	668	1,990	448	3,782	804	772	1,870	470	27	3,943	7,725
	October.	1,033	1,005	2,941	663	5,642	1,158	1,166	2,772	633	20	5,749	11,391
	November.	1,164	1,275	3,011	719	6,169	1,393	1,288	3,240	717	25	6,663	12,832
	December.	819	903	2,650	690	5,062	975	967	2,785	731	27	5,485	10,547
		9,648	10,228	23,447	9,605	52,928	10,494	10,617	22,656	9,615	99	53,481	1,06,409

Average per month, 6,650 Boats.

Ditto per diem. ... 222 "

JAMES PRINSEP,
Superintendent of Canals.

(Signed)

CALCUTTA:
SUPERINTENDENT CANAL'S OFFICE,
7th January. 1832.

No. 84. a.(7)

List of the Boats passed through the Tolly's Nulla.

Boats passed to Calcutta.														Boats passed from Calcutta.																											
Boats of 4,000 maunds.	2	4	45	36	158	170	233	156	108	85	84	45	167	1	159	1	0	0	1,437	6	21	66	67	147	143	155	152	105	107	77	57	124	3	195	2	0	0	1,471	2,556		
Ditto of 2,500 ditto.	42	102	83	88	155	157	119	172	67	110	33	30	105	3	170	6	0	1	1,580	35	130	50	112	155	108	97	89	69	108	85	52	176	2	159	5	2	0	1,465	2,855		
Ditto of 2,000 ditto.	28	94	97	114	155	145	151	122	95	144	31	53	143	4	209	11	2	0	1,501	56	116	162	93	145	102	120	79	79	125	41	34	133	6	157	7	8	0	1,431	3,038		
Ditto of 1,500 ditto.	13	64	64	83	132	150	180	159	144	159	68	87	156	0	297	5	0	2	1,759	17	85	51	50	171	165	143	124	55	130	45	73	180	5	245	5	6	1	1,659	3,458		
Ditto of 1,000 ditto.	al,	85	264	289	321	630	675	653	506	414	525	216	227	572	8	865	23	14	3	1	6,276	114	353	345	302	690	513	555	444	349	450	201	216	613	16	792	19	15	1	6,067	12,333
Ditto of 700 ditto.																																									
Ditto of 500 ditto.																																									
Ditto of 300 ditto.																																									
Ditto of 200 ditto.																																									
Ditto of 100 ditto.																																									
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Small ditto.																																									
Dingee ditto.																																									
Pinnace ditto.																																									
Saltee ditto.																																									
Half Budgrow.																																									
Bhowalia.																																									
Large Boats.																																									
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Total of Boats.																																									
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Dingee Boats.																																									
Pinnace.																																									
Saltee.																																									
Half Budgrow.																																									
Bhowalia.																																									
Large Boats.																																									
Small ditto.																																									
Total.																																									
Grand Total.																																									

(Signed) JAMES PRINSEP.
Superintendent Canals.

Average per month, 3,054 Boats
Average per diem, 103 Do.

No. 85.

No. 4795.

FROM THE MILITARY BOARD.

TO THE HONORABLE SIR C. T. METCALFE, BART.,
Vice-President in Council.

Fort William, 3rd April, 1832.

HONORABLE SIR,

We have the honor to submit for the consideration and orders of your Honor in Council, the annexed copy of a letter from the Superintending Engineer, Lower Provinces, No. 2259, of date the 7th February last, together with copies of its enclosure and the Report and Plan, in original, which accompanied it.

2. This Report, we think, on the whole, satisfactory and creditable to Mr. Prinsep. An application has been made to the Harbour Master's Department for the use of a Boat required to remove the roots and stumps of trees in the Mofussil Canals as recommended in the 6th Paragraph of the Superintending Engineer's letter.—The unserviceable tools, adverted to in the 35th Paragraph of Mr. James Prinsep's Report, will be disposed of in the manner that may appear most judicious.

3. With respect to the Dams, or weirs [? wears] recommended by Mr. Prinsep and by the Superintending Engineer to be constructed at each of the City Drains which at present empty themselves into the Circular Canal, we have authorized one to be constructed as an experiment: the result will enable us to decide whether the plan ought to be adopted in all the Drains or not.

4. We have also the honor to submit for the consideration of Government the under-mentioned bills received with the documents above adverted to, and to recommend that they be passed.

Bill (No. 95, Book E, of 1831-32, Military Board Office) by Mr. James Prinsep, Superintendent of Canals, for completing the Baminghatta Canal from December 1830 to July 1831, amounting to Sicca Rupees 2,385:6:9½.

Bill (No. 96, Book E, of 1831-32, Military Board Office) by the same Officer, for levelling and making tracking-path along the Banks of the Baminghatta and Bojediggie Canals from November 1830 to June 1831, amounting to Sicca Rupees 817:14:7.

Bill (No. 97, Book E, of 1831-32, Military Board Office) by the same Officer, for expenses incurred upon the Dredging Boat No. 1, employed at the Entallee Canal from Koodghatta to Salt Lake, from 1st December 1830 to 30th April 1831, and afterwards within the Circular Canal, amounting to Sicca Rupees 1,646:15:5.

Bill (No. 98, Book E, 1831-32, Military Board Office) by the same Officer, for expense incurred upon the Dredging Machine No. 2, employed at the Entallee Canal, Koodghatta to Salt Lake, from 1st December 1830 to April 1831, and from May to 30th June 1831, cutting the Bunds of the Circular Canal amounting to Sa. Rs. 1,787:14:3.

Bill (No. 99, Book E, of 1831-32, Military Board Office) by the same Officer, for expense incurred in excavating the Circular Canal, from 1st December 1830 to 30th June 1831, amounting to Sicca Rupees 59,184:0:2½.

Bill (No. 100, Book E, of 1831-32, Military Board Office) by the same Officer, for expense incurred in Bunding and excavating the Entallee Canal at the confluence of the new Circular Canal, amounting to Sicca Rupees 917:9:5.

Bill (No. 101, Book E, of 1831-32, Military Board Office) by the same officer, for expense incurred in re-excavating Lots Nos. 42 to 44, length 307 running feet, near the Bytaconna Bridge, and removing soil deposited from the Drains, during the rains of 1830, amounting to Sicca Rupees 511 : 8 : 4.

Bill (No. 102, Book E, of 1831-32, Military Board Office) by Mr. James Prinsep, Superintendent of Canals, for expense incurred in Bunding and re-excavating Lots Nos. 2 to 4, length 293 running feet, near Nurkooldanga Bridge, and removing soil deposited from the City Drains, during the rains of 1830, amounting to Sicca Rupees 871 : 7 : 6.

Bill (No. 103, Book E, of 1831-32, Military Board Office) by the same officer, for the original cost of various tools, pumps, &c. purchased for the Mofussil and Circular Canal works, at various times, and not entered in the Canal Bills, showing the loss by wear and tear, up to the 30th June 1831, amounting to Sicca Rupees 7,679 : 8 : 7½.

We have the honor to be,

Honorable Sir,

Your most obedient Servants,

T. ANBURY. *Col., Chief Engineer.*

A. GALLOWAY, *Lieut.-Col., M. M. B.*

D. McFARLAN, *Chief Magist., M. M. B.*

JOHN CRAIGIE, *Member M. B.*

(No. 86 and No. 87 omitted.)

No. 88.

FROM CAPTAIN F. JENKINS,

TO CAPTAIN YOUNG,

Secretary to the Military Board.

Sir,

Calcutta, 16th April, 1832.

I have the honor to acknowledge the receipt of your letter of the 12th instant, (on the 14th) and in submitting my reply, I beg you will express my regret to the Military Board, that my opportunity of observations was so very cursory, that my remarks, I fear, will be little worthy their notice.

2. Having in the previous season, come through the Sunderbunds by the usual passage, I was desirous of returning, this time, by the new Cuts. I accordingly enquired at Culna [? Koolna] whether they were open or not, apprehending that parts might be unfinished or again obstructed; I got no decisive answer, no one appearing to have passed through them lately, nor to know whether practicable, and by Boats of what draft of water they could be navigated. I was dissuaded from making any attempt to proceed by them, not only by my own boatmen, but by natives of the Salt Depôt at Culna, and by an old native resident Pilot, who assured me, that at any rate, I should not save time by going by the new Cuts, a point which I had previously had reason to suppose.

3. I mention these circumstances, because I infer from them, that if, as I presume, the object of these Canals was to facilitate the Navigation of the Sunderbunds for the larger classes of Boats, in which all the valuable traffic of India is conveyed, that result has not yet been effected by the operations at present completed.

4. The parts of the Canals in question have doubtless been attended with some conveniences to the estates cut by them, even in their present state, but I am not inclined to

consider the advantages so gained as of much moment, for they are merely local, and the country is every where intersected at such very short intervals by North and South streams, that the produce of all the lands within the Delta could be brought down to the natural transverse passages, by which the general trade has always been carried on, with little difference in the time that now suffices for the transport by the new Cuts, and it is therefore only a few particular spots, that are now greatly benefitted, not the tract generally.

5. As I did not come by the Northern Cuts from Culna, the only parts of the Canals that fell under my personal observation, were the division from Bhaminghatta to Chingraghatta, and that portion of the Entally Canal from the latter place to the old Bridge: of the mere existing state of these I have little to communicate, the latter portion is in far better order and under a better system of arrangement of the Boats at their moorings, than I ever recollect to have observed, and the latter was unobstructed except for the largest class of timber Boats, between the 2nd and 1st Chokeys, for which at the very top of a high spring-tide there appeared to be an insufficiency of water. I shall venture to make a few remarks on the Canals, and trust to be excused by the Board should they not be considered strictly relevant to the subject they have proposed to me.

6. I came into Calcutta with a more than usually high spring-tide, driven in by a strong Southerly wind probably, the first turn of which I got at the western end of the Attara Banka about 10 A. M., and I carried it with me all the way to Calcutta, which I reached a little before 7 P. M. Up to Tardah the current was very strong, but after leaving the Eastern mouth of Tolly's Nullah, it had less velocity, though much more than I had ever experienced there, or should have expected to find in a Cut which has as yet no outlet into the great river. The water had however risen very little above the level of the edge of the banks anywhere, but as by numerous gaps it had access to the lower lands within, it ran off violently, submerging, but not deeply, a very extensive surface of country, a circumstance that might, it occurred to me, be turned to great advantage in the course of the construction of the new Canals.

7. It seems evident, that by bunding off the low lands, a measure that could not be attended with any considerable expense, and must be followed by the greatest benefits to the health of the community and to the commerce and agriculture of the town, the head of water in the Canal would be greatly increased, which is much required for the improvement of the Navigation, and the velocity of its current consequently augmented, which I conceive might be of great utility in carrying off filth, and by scouring the Cuts. This increased head would be perfectly under command with common flood-gates in the embankments, to allow the water to be dispersed over the morasses, should there be occasion to do so, which I do not foresee.

8. It strikes me also that the present wharfage is greatly insufficient for the Boats employed on the commerce, brought via the Salt Lakes, and although this deficiency will in some measure be remedied when the Boats can lie in the new Cut as well as in the Entally Canal, yet, I consider that a longer line of wharfage Eastward beyond Chingraghatta is very desirable, and this would be gained for the trade by the embankments I have suggested, were they made of a sufficient width for carts, which I think it would be good policy to effect at their first construction. The Boats now lying in the Entally Canal are obliged to be moored head on to the bank for want of room, but this necessity is much to be deprecated, as the section of that Canal is of such inferior width, that the large Boats can with great difficulty pass backwards and forwards when the bank is lined with Boats in that position, whilst their giving and taking cargo is greatly retarded from the want of good communication to the bank. Were the roads on either side continued to Tardah, these inconveniences would be entirely obviated, and the large Boats, whose cargoes are now brought up in smaller craft, could lie and land their cargoes wherever

it was convenient to them to do so, and the upper parts of the Canals would be greatly relieved of the number of Boats now so greatly obstructing the thoroughfare of the trade.

9. The large sea-going Boats, Mug, Burmese and others, never come up above Bhaminghatta from the want of water, but embankments would either enable them to come close up to Balliaghat or remove the inconvenience which now attends their lying at a place which has no land communication with Calcutta. This branch of the trade will be greatly extended from our improved relations with the eastern coasts, and it must of course be our policy to facilitate its extension by all expedient means, and I think a continuation of the Roads from Calcutta to Tardah by the Salt Lakes, and also from Gurriah-hath by Tolly's Nullah, would afford great facilities to the trade, at a very comparatively inconsiderable outlay.

10. Other collateral advantages would, in my opinion, result, especially with reference to the clearing of the wastes in the Sunderbunds, which from my own observations these two last seasons, I can announce is proceeding with great rapidity ; and this leads me to suggest the extension of the Roads I have already advocated to Badurtulao, a large timber mart, 5 or 6 miles below Tardah. Immediately South of that point commence the tracts now clearing by Europeans, and the national importance of the enterprize on which they have embarked their capital would seem to demand the assistance and attention of Government. I am not aware whether the Government has secured for the public the right of tracking and travelling by the boundary bounds of the several grantees, but I think that future difficulty might now, if that right has not been insisted on, be obviated by the prolongation of the Roads to Badurtulao, which would be of immediate and great benefit to all the neighbouring grantees, who would, I have little doubt for the favour, concede the right of thoroughfare, and probably enter into the views of Government, and continue and maintain good Roads along the fronts of their respective estates, for their own property will improve in value, as the adjoining properties improve, and good Roads and tracking paths will greatly conduce to the rapid advancement of all the tract now in course of being cleared and cultivated. There is nothing in the circumstances of the land here or of any part of the Sunderbunds that I know, which oppose more difficulties to the construction of good Roads than any other parts of Bengal, rather the contrary, for the comparative level of the lands is greater and nearly constant, the land floods being reduced to the tide levels.

11. I would beg to suggest to the Military Board whether it would not be expedient to widen that part of the Canal below Chingraghatta to about thrice its present width, and for a considerable distance, perhaps not less than a mile, and of sufficient depth to contain the largest class of lime and timber Boats, they would in that case all lie out of the way of Boats proceeding backwards and forwards, a desideratum much required, and the earth from the excavation would afford such good ground for the erection of Godowns, that I think all the expense of the additional cutting would be fully covered by the rent the Government would thence realize. A smaller excavation and in the form of a basin, would be a convenience to the community and also probably profitable to the Canals, as a haven to be solely appropriated for the very numerous fishing Boats that frequent that end of the Canal, it is desirable that this species of craft should have ready access to a good birth and lie out of the way of the great trading Boats ; the additional expense that would be entailed in effecting these objects would be, I conceive, fully covered by the rent of the lands, for a spacious Fish Bazar is an establishment much wanted by the Town.

12. I am not informed whether the Board contemplate placing lock-gates at the end of the Entally Canal towards the Salt Lakes, but I would beg to mention, that in my opinion such gates would be of great subsidiary utility, and specially if connected with a cross Cut to fall into Tolly's Nullah below and near Gurriah-hath by which the tides from

the Lake might be diverted, avoiding danger from their accumulation, should it be requisite to empty the Canal for any purposes particularly to cleanse it in any part, an operation which would be thus greatly facilitated. The cross Cut would be of extensive advantage otherwise, to that part of the Town, even were its dimensions much smaller than those of the new Canal, for as the large Boats will have by this a direct passage to and from the Hoogly, it would seem to be unnecessary to provide another passage for them, the local trade and Drainage of the South-eastern end of the Town being principally the objects to be attained by the cut, I now recommend.

13. I cannot conclude this letter without bringing to the notice of the Board the only real and a most serious obstruction to the more valuable part of the traffic proceeding by the Sunderbunds, that which passes Dacca, either proceeding to or from the Presidency. I allude to the existing necessity of proceeding for some distance by the united stream of the Megna and Ganges, which is pregnant with constant delay and the utmost danger to all common river Boats. My knowledge of that part of the country will not allow me to offer any other suggestion than the propriety of having Surveyed the lines of the Tagoorpore, Toolsey, and Churan Creeks (Rennell's Atlas No. XII.), or other present Nullahs, with the view of ascertaining whether at an expense not inordinate to the advantages proposed to be gained the above truly serious part of the Navigation might not be saved. The great rivers now effect their junction more than 20 miles above the point at which they joined in Major Rennell's time—the Navigation from Dacca to Burrisal is in consequence now totally altered and is still changing, an alteration that has been attended with enormous destruction of property, and which promises to occasion yet greater losses before the streams have worked out a sufficient and a fixed Channel. Government, I apprehend, can do nothing to avert the threatened calamities, but it seems to be a matter of regret that no attempts have been made to improve the Navigation from Dacca to Burrisal by cross Cuts, nor to correct the Charts, (published in 1780,) to the existing state of the Channels now navigated from Culna [? Koolna] to Dacca.

14. The great value of the traffic that comes through the Sunderbunds, the total inadequacy of Tolly's Nullah and the Entally Canal, to allow the immense tonnage employed in its transport to pass backwards and forwards, and to reach convenient wharfage at Calcutta or in the Suburbs, and the probability of this trade being shortly greatly increased by the extension of cultivation throughout the wastes of the tract in question, are topics on which I need not enlarge in addressing the Military Board, they seem most urgently to demand the completion of the improvements now in hand under their direction, and the entire and vigilant attention of a Superintendent to conduct and maintain those works, and promote measures for further facilitating a commerce of vast and growing importance.

(True Copy,)

G. YOUNG,
Secretary Military Board.

No. 89.

No. 97.

FROM THE MILITARY BOARD.

TO THE HONORABLE SIR C. T. METCALFE, BART.,

Vice-President in Council.

Fort William ; 1st May, 1832.

HONORABLE SIR,

Department of Public Works.

A Report from Captain Jenkins,
on the Canals in the Sunderbunds
and on the Entally Canal.

We have the honor to submit, for the information of Government, the annexed copy of a Letter dated the 16th ultimo, from Captain J. Jenkins, submitting observations on the new Canals in the Sunderbunds and on the Entally Canal

2. The above Report contains information, which may hereafter prove useful.
3. We have furnished the Superintendent of Canals with a copy of this document.

We have the honor to be,

Honorable Sir,

Your most obedient Servants,

T. ANBURY, *Col. Chief Engineer.*

A. GALLOWAY, *Lt. Col. M. M. B.*

D. McFARLAN, *Chief Mag. and M. M. B.*

J. McKENZIE, *M. M. B.*

No. 90.

No. 570.

TO THE MILITARY [BOARD.]

Miscellaneous Revenue.

GENTLEMEN,

24th April, 1832.

I am directed to acknowledge the receipt of your Letter dated the 3rd instant, on the subject of the Eastern Canals.

His Honor in Council concurs with your Board in thinking Mr. J. Prinsep's Report on the whole satisfactory and creditable to him.

The application you have made to the Harbour Master's Department for the use of a Boat to remove the roots and stumps of trees in the Mofussil Canals is approved. The expense will of course be charged to the Canals.

The object contemplated in the erection of dams or wears at the mouths of the city Drains is important, and his Honor in Council desires that a Report may be hereafter furnished on the success attending the one, which has been ordered to be experimentally constructed.

The several Bills submitted with your Letter are passed, and here returned with the usual endorsement.

I have &c.

(*Sd.*) J. Y.

P. S.—The other original Papers submitted with your Letter under acknowledgement are likewise returned, copies being kept for record.

(No. 91. to No. 94. inclusive omitted.)

No. 95.

No 144.

FROM LIEUTENANT-COLONEL R. TICKELL,

Superintending Engineer, Lower Provinces,

TO CAPTAIN G. YOUNG,

Secretary Military Board.

SIR,

Barrackpore, 14th June, 1831.

With reference to your Letter, No. 222, of the 17th ultimo, I have the honor to enclose copy of a Report No. 326, by Mr. Prinsep, on the effects likely to be produced on the Drainage of Calcutta, by opening the proposed communication between the Circular Canal and River at Chitpore, from which it appears, that no detriment whatever is to be apprehended from the proposed communication through a Lock passage, which can be closed, as occasion requires, during the rains, and, that were it even thrown open during that period, no more inconvenience would ensue than has hitherto been occasioned by the Marhatta Ditch.

I have the honor to be,

Sir,

Your most obedient Servant,

R. TICKELL, *Lt. Col.*,

Superintending Engineer, Lower Provinces.

No. 95. a.

No. 326.

FROM JAMES PRINSEP, ESQ.,

Superintendent Canals.

TO LIEUTENANT-COLONEL R. TICKELL,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta, 5th June, 1831.

I have the honor to acknowledge the receipt of your Letter No. 239, dated the 25th ultimo, directing my attention to the subject of the alteration of the level of the Circular Canal likely to ensue upon opening the communication at Chitpore with the River Hoogly, and the consequence thereof to the Drainage of the City.

2. It need not be pointed out, that the scheme proposed for the Circular Canal, never contemplated leaving open this communication during the rainy season, indeed it has been deprecated from the commencement, since, even if no inconvenience were likely to accrue to the Drainage, such damage would inevitably ensue to the banks and bed of the Channel from the velocity and turbidity of the river water as would soon completely destroy the main objects of the Canal—permanency of section and depth.

3. But I presume the case is only put as a possible contingency, and it will be always advantageous to be prepared for such; and to know beforehand, as far as the intricacy of the subject will admit, what might be the consequences of leaving the passage open to the freshes.

4. It occurs to me that the clearest mode of investigating the subject theoretically, will be to pass under review all the circumstances of variation of level and trace the concomitant effects upon the velocity, slope, and level of the Canal at its midway course, or between the Narkooldunga and Bythukhanah Bridges, which is also the medium position of the system of Drains.

5. The utmost difference of level between the River and Lake being about 10 feet, we have the several intermediate

Differences of level.

0	ft. 1	ft. 2	ft. 3	ft. 4	ft. 5	ft. 6	ft. 7	ft. 8	ft. 9	ft. 10
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And assuming the length of the Canal to the point where its waters expand in the Lake to be 6 miles, we obtain the

Slopes of the Surface.

1	1	1	1	1	1	1	1	1	1
31,630	15,840	10,560	7,920	6,340	5,280 ⁽¹⁾	4,525	3,960	3,409	3,168

Remarks in pencil on this Paper by a Member of the Military Board, ? Col. A. Galloway. —J. M.

(1) ? 2,610.

Now the average section of the Canal being $\frac{80+60}{2} \times 9$ ft. = 585 feet, and the border about 84 feet, the hydraulic mean depth deduced, is 83.6 inches, and the

Velocity⁽²⁾ corresponding with the above Slopes.

Inches per sec.	15.7	20.2	25.7	30.1	34.2	37.9	41.3	44.5	47.6	50.0
or Miles pr. hour.	0.9	1.2	1.5	1.7	1.9	2.2 ⁽³⁾	2.3	2.5	2.7	2.9

(2) Captain P's, velocity is $4\frac{9}{10}$ miles an hour.

(3) 4.1.

And the Quantity of water delivered per second will be

milli.										
C. Inches.	1,310	1,630	2,160	2,520	2,856	3,192 ⁽⁴⁾	3,444	3,738	4,032	42,000,000 C. In.

(4) 6,381.

which sums divided by the area of the entry or Lock Basin (increasing it in proportion to the depth of water) will give the velocity of the water in passing through the Sluice passage, the section at the Zero of levels is 24×8 , and the border 40 feet, therefore we deduce

The velocities required to maintain the Canal discharge

Inches per Sec.	43.2	43.6	57.0	60.8	63.6	65.3	71.2	74.6	77.8	80.0
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and these velocities will require a slope in the Sluice Channel (which we may call 300 feet at least in length) of

Inches.	1.0	1.2	1.4	1.6	1.8	1.9	2.1	2.3	2.4	2.5
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but they will also require a head of water for their production; since the River may be regarded as a stagnant Reservoir—this

Head of Water Estimated as $\sqrt[3]{2}$ will amount to

Inches.	3.7	4.8	6.5	7.4	8.2	8.8	10.1	11.3	12.1	13.0
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so that the total *difference of level* required for the maintenance of the velocity and slope of the Canal as given above, will be

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
1.4.7	2-6	3-8	4-9	5-10	6-11	8-0	9-1 $\frac{1}{2}$	10-2 $\frac{1}{2}$	11-3 $\frac{1}{2}$

and for these several conditions the surface of the Canal midway or near Scaldah would be on the standard tide gage

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
+2-6	+3-0	+3-6	+4-0	+4-6	+5-0	+5-6	+6-0	+6-6	+7-0

or assuming the level of the *Circular Road* at nine feet⁽⁵⁾ above zero, there will be left a depth in the several Drains to carry off the rain

(5) It is 12 feet.

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
6-6	6-0	5-6	5-0	4-6	4-0	3-6	3-0	2-6	2-0

The two last columns, wherein the height is beyond 10 feet, may be rejected from consideration, and even the next two must be taken as extreme cases, for the river is but a short⁽¹⁾ season at its greatest elevation, and the effect of the ebb has been entirely omitted in the above calculations.

6. I think therefore we may assume safely (+5 feet)⁽²⁾ as the *utmost* mean daily level of the Canal during the freshes, supposing the communication were left open through one lock passage without impediment, this would bring the Canal water up to the floor of the Bytukkhanah Drain, and a foot or two above the other Drain floors; but the capability of a Drain to carry off water must not be estimated so much from the floor, as from its general depth from the surface of the ground; it cannot be said that the Drainage is suspended, until the Canal is level with the Road, which cannot obviously take place while the Salt Water Lake has a free vent to the south.

7. But in a practical way, and perhaps therefore more satisfactorily, than by a vague theoretical view, good information as to the consequence of opening the Circular Canal to the River, to the Drainage of the Town, may be sought from the parallel⁽³⁾ case of Tolly's Nala.

8. This Nala has not the advantage⁽⁴⁾ of a level Lake surface to centralize the effect of the water poured in; none of the impediments at its various Bridges are equal to the proposed contraction at the lock entry of the Canal, and yet from the temporary lift of the tide during the freshes, twice a day, the utmost effect beyond Allipore Bridge (distant $1\frac{1}{2}$ mile) is to raise the level of the Nala 7 feet 10 inches above the mean level of the River, although there is in this case no obstruction at the mouth, such as would be caused by the contraction of a lock passage. At Tollygunge, distant 4 miles, or about as far as the junction of the Circular and Entally Canals, the maximum rise is only 5 feet above the mean⁽⁵⁾ level; so that it may be confidently argued that, in any case, the cills [?] sills] of the Bytukkhanah and Dhurmtullah Drains would remain unaffected. Gurryahat, distant 7 miles, has a rise of $4\frac{1}{2}$ feet, and may be compared in relative situation with the 2nd Chokee on the Lake Channel, but in the latter place, from its capability to spread over a large surface, the rise would necessarily be greatly less: indeed the late Superintendent in a memorandum on this subject, drawn up I presume for the Canal Committee, computes the rise of the Salt Water Lake⁽⁶⁾ from the action of the Canal, supposed open, at not more than six inches.

9. I beg leave in conclusion to refer you to my brother's several communications on the question now referred to myself, and to explain that, although I agree with Major

Remarks in pencil on this Paper by a Member of the Military Board ? Col. A. Galloway.—J. M.

(1) Yes, but one day's damage might be irretrievable.

(2) Five feet—yet the difference of level is stated at 10 feet, but is in reality 12 feet.

(3) This is not accurate. This is an egregious error! There is nothing similar. See following note. ♦

(4) "Advantage" indeed! why it is this low and level Lake which is so sure to increase the current through the Canal, and it is the length of the contracted passage of Tolly's Nullah which creates the impediment to the current, the water having consequently no power of sudden expansion, is kept at a height throughout, and finds its way with difficulty; not so the Canal with the Lake as an outlet, so that this is the very reverse of a parallel.

(5) It will not do to take *mean* any thing—but the highest level of the River to guard against danger. It is not the *mean* velocity of wind, but storms which are dangerous.

(6) We have nothing to do with the rise of the Salt Water Lake—except in so far as its not rising will obviously make the current through the Canal the stronger, by giving an infinitely greater declivity.

Schalch and himself in the impropriety of leaving the communication open, still as far as regards the mere Drainage of the Town, I do not think that very great detriment* would ensue; not more than must always have been experienced in the neighbourhood of the Sham Bazar, where the level of the Marhatta Ditch in the rains must have been at times nearly even with the Road.

* See Papers marked No. 9 (page iv) No. 12. No. 13. No. 13. a. No. 38. No. 38¹. and No. 96.—J. M.

I have, &c.,
(Signed) JAMES PRINSEP.
Superintendent Canals.

True Copy.
R. TICKELL,
Superintending Engineer, Lower Provinces

No. 95¹/₂.

No. 367.

To CAPTAIN GAVIN YOUNG,
Secretary to the Military Board, &c. &c.

SIR,

I have the honor to acknowledge the receipt of your Letter dated the 22nd instant, enquiring the cause of my delay in replying to your Letter of the 9th August last.

2. The Letter in question desired me to advert in my report on the subject of the Lock-Gates, to the point of "what time would be taken to fill the chamber of the Lock in the passage of Boats to and fro." I beg to explain that I considered the Letter as a Memorandum to which advertence should be duly made when my plan should be transmitted to Colonel Tickell, and not as calling in any way for a direct or immediate reply, which could not in fact be given until the dimensions of the Sluice, &c. were finally resolved upon.

3. It had been customary to send in Plans and Estimates along with the annual Reports and accounts of the office, and it was my intention to have done the same. I regret, however, to acknowledge that the accounts are considerably delayed this season, partly from the circumstances of the usual monthly accounts having been suspended by order of the Board, and directions given that the accounts should be made up at the close of each work. They are now, however, nearly ready, and shall be transmitted without delay.

4. I beg to submit for the information of the Board, that the alterations which I purposed introducing into the Plan of the Lock-Gates, are but slight modifications of the original Plan, which having been submitted along with a model, to the late Canal Committee, and having received their approbation and the sanction of Government, I felt it less imperative to devote my attention to the revised Plan, having plenty of time before me ere the excavations (already commenced) will be ready for the foundation to be marked out.

5. Should the Board be desirous to see my Plan, before it goes to the Superintending Engineer, I shall be obliged by your favoring me with their orders to send it direct, as upon former occasions, I have had the misfortune to incur their displeasure for doing so.

I have the honor to be,

Sir,

Your most obedient Servant,
JAMES PRINSEP,

Superintendent Canals.

CANAL OFFICE:
26th November, 1831.

No. 96.

Minute upon the Paper marked No. 95. a. by LIEUTENANT COLONEL GALLOWAY.

13th July, 1831.

I should be glad could I take the same view of this question which is taken by the Chief Engineer; if indeed that view be adopted on the supposition of the river being admitted to flow into the Canal. On that supposition, notwithstanding Mr. Prinsep's Hydraulic calculations, which by the bye are founded on inaccurate data, notwithstanding what Mr. Prinsep has written, I confidently agree with Captain Schaleh and Captain Prinsep, that the admission of the river would in the rains impede, and during the high tides of the freshes, entirely obstruct the Drainage of Calcutta.

But we are told that the Marhatta Ditch on one side, and Tolly's Nullah on the other, do not injure this Drainage! What is the fact? The principal Drains of Calcutta, do not fall into Tolly's Nullah. But if they did, what then? Why it has been found necessary to put sluices on the inlets from Tolly's Nullah at Bowaneepore, and on the Marhatta Ditch near Baugbazar, not merely to protect the Drainage, but in order to preserve the Town from inundation! "At Bowaneepore (says Mr. Bleychenden) there are sluices for the purpose of keeping the water from Tolly's Nullah out of the Town," surely this is known to the Board? What then, is the use of Hydraulic calculations, to shew that the river, if admitted into the Canal, would not injure the Drainage of Calcutta, when we positively know, that if it were not for sluices, the water from the inlets already in existence, would not only stop the Drains, but would inundate the streets. Thus so widely have facts been overlooked, that the instances of Tolly's Nullah and the Marhatta Ditch, which have been quoted in support of Mr. Prinsep's theoretical calculations, must be quoted against them.

Another very heavy mistake in Mr. Prinsep's Report, will not have failed to attract notice in Par. 5, in which he states, "that the utmost difference of level between the River and Lake being about 10 feet, we have, &c." Whereas Captain Schaleh, whose levels are admitted by all to be perfectly accurate, says distinctly—"The Hoogly rises *upwards of 12 feet above* the level of the lake," and both are speaking of the same period—the rains; of what use then are calculations founded on such oversights as these. Mr. Prinsep in his calculations again assumes the level of the Circular Road to be 9 feet above the Lake; but Captain Schaleh gives the level of that Road to be at Ooltadanga, "11 feet *above the Lake in the rains*"—"and the surface of the water in the Canal, in the rains, *would be at this place, at high-water, a foot and a half above the level of the Circular Road.*"—And are Drains which pass *under* this Road, not to be affected by the Canal? Captain Schaleh adds "and as the river at that season does not frequently fall 10 feet, *there would be no possibility of Draining this part of the Town into the Canal, if the river flows into it*"—again, "at the Eastern extremity of Bow-Bazar Street, in the rains, *the highest rise of the tide in the Canal will be on a level with the Road.*"

"Without the Lake (Captain Schaleh goes on to say; that is, without the fall of *level it gives*) the greater part of the Town would be under water for three months *in the year: without it many of the most populous streets after a heavy fall of rain, would be 3 feet under water; and it might so happen that in some there would be a depth of water above an ordinary man's stature*"—Captain Prinsep has also clearly expressed his opinion that the Drainage of Calcutta would be deranged by the admission of the river into the Canal. It is therefore idle, I conceive, after having shewn that Mr.

Mr. Bleychenden's
[? Blechynden]
Report, 14th Feb-
ruary 1831 *Supra*.
pag. xvii No 13. a

Captain Schaleh's
printed Memoir
See Appendix to
Appendix (G),
page xvii.

Ibid, page xx.

Ibid.

Ibid

Ibid, page xxi.

James Prinsep has stated inaccurate levels and other data imperfectly,* to add that his calculations founded on these must be erroneous.

It is idle, I conceive, to shew beyond the mere statement of the fact, that if the bottom of the Calcutta Drains at the Circular Road, as stated by Mr. Prinsep himself, be in some cases only 1 foot 4 inches, in others 2 feet 3 inches, or 3 feet 1 inch, &c. above the water in the Canal now, before the river is let into it, you cannot let much more water into that Canal without its affecting those Drains. Yet it has been shewn, that the river would, if it were let in, rise there *full 11 feet* higher than the water now is; that is, 11 feet higher than the level of the Lake (which is now that of the Canal, and which will continue to be so if not cut through into the river), higher indeed than the streets under which those Drains run. Mr. Prinsep's reasoning on the contraction of the Channel by means of the narrower chamber of the Locks, is perfectly just in the Abstract; but like much more theory, it is inapplicable: and to this Canal quite imaginary, since you dare not open this narrowed channel to the weight of 12 feet water before it, without creating such a torrent through it as would undermine the sill and tail of your Locks, and utterly destroy them in a single day.

On the other hand, nothing can be so favorable for the Drainage of Calcutta as the Canal in its present state. Cleaned out, *but not Cut into the River*, its level can never rise above that of the Lake, the Drains fall into it immediately, instead of having to wander each by a devious narrow Channel to the Lake, at a great distance, with corresponding obstructions to its flow. It is tantamount to bringing the Lake to the very verge of the city, without the city being exposed to its pestilential vapors, and the whole Eastern and Northern circuit of Calcutta is open (to within a few hundred yards of as much as it can be made by cutting into the River) to the whole of the Eastern Navigation. Here then, has every point of benefit to Calcutta aimed at, been gained (without any manner of risk) except one, namely the passage, at the particular spot of Chitpore, from the Hoogly through the Sunderbuns. This has not been opened. What then? why, by going down the River from Chitpore to Tolly's Nullah, about *four and a half miles*, I meet with a passage infinitely superior to this Canal, free from all the impediments of Locks: and if I desire to proceed by the Eastern line of Canals (should they be open), I have only to go $4\frac{1}{2}$ miles from Tarda, and I get into the mouth of these Canals, having just escaped the shoals and the baffling winds, and the lee-shore of the Salt Water Lake. Thus every advantage is obtained; every risk avoided.

But another question has now arisen out of these Reports. We are now told that "the communication by the Canal, when Cut through into the River, is not to be left open during the rainy season; for, if it were, the velocity of the current would destroy the Canal." This is Mr. Prinsep's account in these Papers; and I am glad to find that "the communication is not to be left open," because it removes several objections which were offered by me to carrying on this Canal into the River. And I may here express my satisfaction, that the objections which were made by me to the former Plans and model of the Lock in question, as exhibited to the Board, have occasioned, as I am informed, a revisal of those Plans, &c, which are now found to be imperfect. I have reason to believe that revised Plans for Locks of a more solid and substantial and better form, have been, or will be, prepared. This is so far well.

These will doubtless be brought before the Board. But, after what has been written on this Canal; and after the advantage of possessing a free communication with the River

* Note—So indefinite are all these calculations, that I observe for a slope of 10 feet, Mr. J. Prinsep gives the current a velocity of 2.9; whilst Captain Prinsep for 8 feet gives a current of 3.4!!! See Par. 16. Memoir by Captain Prinsep, Appendix (H) page 82.

at all seasons, has been so fully expatiated upon, must we not now go up and tell Government what we now understand that this Circular Canal was "intended to be:" for it now appears, according to Mr. Prinsep, that "*it never was intended*, that during the rains this communication should be left open; and that it could not without destroying the Canal itself." It is likewise stated by Colonel Tickell, that "the Canal is to be shut to navigation for two or three months in the year." So also in a subsequent Minute by Colonel Craigie, I observe it stated (Circulation 18th April) "that the Gates at Chitpore were never intended to be opened during the height of the rains, they are of the description called by the Chief Magistrate, Flood-Gates: and that this is quite obvious on an inspection of the model sent to the Board. The communication with the River during the dry weather was certainly a great improvement on the original Plan, introduced by Captain Prinsep, and approved by the present Superintendent." And other Members of the Board appear to have taken up this view—now this is all new to me. This is not the Canal brought under the consideration of the Board, this is not I apprehend the Canal which Government has authorized the Board to proceed with to completion. This is not Captain Prinsep's Canal. Captain Schaleh is (not Captain Prinsep) the author of the "improvement of the communication with the River during the *dry weather* ; but Captain Prinsep is the author of the plan for *keeping up the communication during the rains*. There is a whole Chapter by Captain Prinsep on what is termed "manœuvring of the Gates;" and he distinctly says—The adoption of this method "of artificial navigation will *secure a daily intercourse with the River during the rains*." Captain Prinsep even contrasts Captain Schaleh's Plan of *closing the Canal to Navigation in the rains* with his own. He says, "Captain Schaleh observes that the stability of the other Canals is built entirely *upon their not being exposed to the freshes of the River*"—(Captain Prinsep's Reports) but I submit a plan by which you secure "a daily communication with the River" throughout the year! Are we then to be told at the eleventh hour, after the plan of opening the Canal Navigation in the rains has been sanctioned by Government, that "it never was intended to be so opened?" I, for one, have been writing with reference to *Captain Prinsep's Plan*. At that period we heard of none other. I also presume that Government has founded its decision, contemplating the execution of that Plan, and no other.

This is a question, therefore, which must be submitted to Government, who will now see that the communication which before they conceived was designed to be complete throughout the year, is to be so but for three-fourths of that period! Government should also be informed that the old Locks which in our former proceedings were contemplated, are now discovered to be imperfect, and that a new plan is under preparation, which doubtless will be attended with additional expense. It will not do for the Board to carry on one scheme of work, whilst the Government have sanctioned another.

The utility of the work having thus been diminished, whilst its expense will be materially increased, before we proceed farther, these points must, I apprehend, be submitted for the consideration of Government. We ought further to consider, since it now appears that only a very diminished strength of current can be admitted from the River, how we are prepared to keep the Canal open from the immense deposit brought into it, not only by the turbid water of the River, but especially by the Calcutta Drains. Further, but supposing we can throw into it a current sufficient to keep it at a navigable depth, whilst it is confined within its own regular Channel and section, how are we prepared to prevent the matter from settling, when this force of current is lost by entering into the extended surface of the Lake. This appears a dilemma. We must have a strong current to prevent the Canal from being choked up. But, if we admit a strong current, we destroy the Canal, and thus, both with and without a current, it must be destroyed.

These are points which should have been brought to the notice of Government with the original proceedings of the Board, on the further prosecution of the Canal; but it is not too late.

Nor is it too late to submit for consideration, another very important point connected with the junction of this Canal with the River: a point which has not hitherto been brought to the notice of Government, notwithstanding all those voluminous discussions; and which I take great blame to myself for having overlooked.

We have seen that the River in the rains rises 12 feet above the Salt Lake. For the rest of the year, that is, for 8 months, however, the level of the River is considerably lower than that of the Lake; so much so, that probably for the greater part of the ebb, the current will set from the Lake into the River.* The extreme low-water mark of the Hoogly is found to be $8\frac{1}{2}$ feet below the surface of the Lake. Now it must be obvious, that as the Canal and the Lake are the common cesspools, into which are thrown the impurities of this immense city: and moreover, as the water in the Salt Lake is within a few degrees of being as salt as it is at Saugor, the quantum of salt water and impurity brought into the River, during an ebb of 7 hours duration, from the Lake and Canal, must be very great. This is an evil of great magnitude to the poorer inhabitants of Calcutta. They are obliged to have recourse to the River for water; and if the Canal be opened, they will be compelled to drink a brackish mixture, polluted with the impurities disgorged by the Calcutta Drains. This will be a frightful addition to the present impure state of the River water of the city. Nor, I am afraid, can it be obviated; for, coming into the River on the same side, and just above the town, the water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream, and thus keep its position in shore, where alone water is accessible. I cannot indeed conceive any thing more grievous to the poorer inhabitants of Calcutta, and population afloat on the River in Boats, and in the Shipping off Town, who are beholden entirely to the River for the water they use, than to have the water they must drink thus polluted.

The following will be the state of the Circular Canal. In the rains it must either be shut up altogether, or it will damage the Drainage of Calcutta; and at all other times we shall have it pouring into the comparatively pure and sweet water of the River, the refuse of the Calcutta Drains, floated into it by the salt and slimy water of the Lake.

But I shall beg leave to assume that Government did not intend to lay out Lakhs of Rupees on a Canal to be shut to navigation for a considerable portion of the year, and for the rest of that period to pollute the purity of the River from so pernicious a source. Among the "advantages" and "disadvantages" of this costly undertaking, we have unfortunately omitted all this. But I am told we are to have Locks; and as they are to be shut, *to exclude the River in the rains*, so they may be kept fast *to save the River from pollution at other times*. True; and they must be shut up so as to do so. But then, as I have before said, this is not the Canal we have described to Government. It is now confessedly shewn of its utility: its influence, as now shewn, must be noxious to the inhabitants of Calcutta: and if I am to judge either from what I have been given to understand, or by the Diagrams of Double Locks on the margins of our Minutes,† the former Plans for completing this part of the Canal are approved of by no one; whilst alterations, to be of use, must inevitably incur a heavy unlooked for expense. I propose therefore, that these documents be submitted for the information of Government, for, as I have before said, this Board cannot, unknown to the supreme authority, continue to prosecute a plan differing essentially from that which was sanctioned by Government, whilst our doing so would burden the State with additional expenditure. Meantime Mr. Prinsep should be required to furnish, without delay, the Plans on which he actually designs to execute the work.

A. G.

* "From the lowest fall of the River to high-water mark in neap-tides, in February, is 8 feet."—Kyd's Tables. In February the River is about its lowest, so that the current will, at neap-tides at all times, set from the Lake then.

† See Diagrams on separate sheet inserted opposite page lxvii.

J. M.

No. 96½.

Military Board's
Proceedings, 17th
May 1831.

*Minutes of the Members of the Military Board, with reference to the
Papers marked No. 28, No. 34, and No. 37 a., in this Appendix.*

Minute by Col.
Sir T. C. Anbury.

I am quite satisfied with Colonel Tickell's Report.

(Sd.) T. A.

Minute by Col. A.
Galloway.

This Report is very clearly and distinctly drawn up, and is satisfactory in so far as we now find that Boats can pass in 60 hours through the line of Canals as far as Balliahghat now at least. Colonel Tickell I believe, however, had the advantage of spring-tides for part of the way. His account however, of the set and sluggishness of tide in some parts leaves but little hope of the permanency of the work. In 60 hours there are five Flood and as many Ebb Tides. I think Mr. Prinsep reckons three Floods as sufficient by the old (Tolly's Nullah) route for heavy Boats. Colonel Tickell very justly remarks, that the Eastern Canals may be considered separately from the Circular Canal. In this view I should not object to a moderate sum being laid out in improving the Eastern Branch: and could it be done permanently, I would lay out money on it rather than on the Circular Canal, which, as a passage into the Hooghly, has no value: since by dropping down to Tarda, a distance of 4½ miles from the mouth of the Eastern Canals, you get into the route by Tolly's Nullah. I was not aware before of the necessity being admitted of keeping the Locks at Chitpore shut altogether for three months in the year.

This Report should be sent up to Government I think without any delay: the Board (at least the majority who have recommended the prosecution of the Circular Canal), should inform Government without a moment's delay, whether it was a Canal that should be open to navigation at all seasons, or one "to be shut to navigation for two or three months of the year," that was designed by them to be recommended.

A. G.

Minute by D.
McFarlan, Esq.

'This is a fair and impartial Report, and valuable on that account. The speed of one passage compared with another in which there are so many Tides, must depend somewhat upon accident, and somewhat upon the watchfulness and alertness of the Boatmen passing through it, and the criterion after all is the disposition of travellers in general to prefer the one to the other. That they prefer the new is indicated in this Report, and in Mr. Prinsep's former ones, and has been stated to me both here and at Jessore, by persons competent to judge: therefore I conclude that no cause has been shewn why Government should regret that the work has been done.

No time should be lost in clearing tracking paths. With reference to Col. Tickell's remarks on the shutting up of the Chitpore entrance, an immediate explanation should be called for. The very nature and design of Locks is, that Craft should be lowered down, or raised to a different level as the exigency might require. If the work is not so constructed the Gate will be only a Floodgate, a very different piece of machinery from what I understand by a set of Locks. By them a vessel may be lowered down the side of a sloping country. How much more easily, from the level of the Freshes of the Hooghly to the pre-adjusted level of the Circular Canal?

D. McF.

Minute by Col. J.
Craigie.

This is a satisfactory Report, inasmuch as it confirms the facts and opinions communicated in Mr. Prinsep's Reports, and shows that the Board came to sound conclusions in recom-

mending that the Canals to the Eastward should remain untouched for a few years, until the extent of their success can be satisfactorily ascertained, and in directing the prosecution of the Circular Canal to completion with the utmost vigour. This Report, with Mr. Prinsep's late one of the 15th April, should be submitted to Government, with the expression of the Board's opinion that these documents strongly confirm the soundness of the views expressed by the Board in their late Report on the subject of the Canals. The information which the Chief Magistrate has attained as to the utility of the new Canals might also be communicated to Government.

The Gates at Chitpore were never intended to be opened during the height of the rains, they are of the description called by the Chief Magistrate Floodgates. This is quite obvious, on an inspection of the model sent to the Board. The Circular Canal would retain much of its advantages if constructed without any opening into the Hooghly as originally intended; but the communication with that River during the dry weather, was certainly a great improvement on the original plan, introduced by Captain Prinsep and approved by the present Superintendent.

J. C.

Col. Craigie's remark is quite correct. The works at the Chitpoor end of the Canal have hitherto been described as Floodgates *not* Locks, as quoted by Col. Tickell and supposed by me.

Minute by D.
McFarlan, Esq.

Having turned the matter over in my mind I cannot discover any reason why we should not have locks. Engineers may perhaps be able to show the impracticability of the scheme, but it has taken such fast hold of my mind that I venture to explain my views to the Board, and especially to the Chief Engineer, should no manifestly insurmountable obstacles occur to him, we might call for a Report on the subject through Col. Tickell from Mr. Prinsep.

When the level of the River is higher than that of the Canal, **BB** only would remain shut—Craft might enter into the space between **AA** and **BB**:—if they wished to pass, **AA** would be shut, and the water lowered to the Canal level.

The same process with **CC** and **DD** when the Canal level was higher than the River. To this general scheme I cannot devise any objection, nor do I see why it should be much more expensive than Captain Prinsep's:—his plan has four Gates.

It would not be necessary to have the work so made as to admit of egress into the River at every possible state of the tide, should it appear that that measure would be inordinately expensive.

D. McF.

The scheme as shewn in Mr. Prinsep's model is evidently intended to be Floodgates only. I am of the same opinion as Colonel Craigie, that the Canal would not suffer in its advantages was there not to be an opening to the Hooghly; but I conceive that its advantages would be enhanced by, and that it would be a principal object of convenience, having open navigation for Craft from that River, above the Town, into the Salt Water Lake and Eastern Canal, averting the necessity of going through Tolly's Nullah at any time: to secure this at all seasons of the year I am decidedly of opinion, that Locks would be preferable and necessary, the only objection that I am aware of against them, is, their heavy cost. By Locks the communication from the Hooghly with the new or Eastern Channel might uninterruptedly be kept up at all seasons of the year, independent of the levels of water in either, and by adopting locks, I conceive, the advantages of the Canal would be, as before observed, considerably increased.

Minute by Col.
Sir T. C. Anbury.

By the means of Locks the Craft using the Canal, might be lifted into the Hooghly at the highest state of the River (i. e. in the rains,) without reference to Ebbs or Floods, or dropped

into the Canal at the same season, independent of the state of the water in the Canal, or level of the Lake. To the construction of Locks I am not at this moment apprehensive of, nor do I contemplate any impediment; and had I been the Executive in this work, I certainly should have strongly recommended Locks, and which was my original opinion, as being the best method of opening the Canal to the River above the Town. The Board I am persuaded are so sufficiently acquainted with the nature and superior advantages of Locks in a navigation through conflicting levels, as not to require any illustration by a diagram to show the method of raising Craft from the lower to the higher levels, and vice versa.

Perhaps a double Lock as described by Mr. McFarlan, might not be absolutely requisite, since the body of water in either column would never be more than could be sustained by a pair of strong single Gates with proper Vanes, which would be constructed in the Gates, and which would let in and regulate the column of water required to lift the Boats from the lowest to the highest level.

If the Canal is to be connected with the River, I recommend Locks and a free ingress and "egress at every possible state of the Tide."

Boats coming into the Canal from the Hooghly, would present themselves at **A A**, the Vane of these Gates being opened would raise the water to the level of the Hooghly, the Gates are then opened, and the Boats' position would be at **A A**. Gates are then shut, and by the Vanes in **B B** the level is reduced to that of the Canal, where they are opened, and the Boats passes into (1), when if she is lower than the level of the Canal, the Vanes of **D D** and **C C** are opened and the level of the Canal obtained: when both are opened, and the Craft enters the Canal, and *vice versa*, an equalable level is obtained for the River.

(Sd.) T. C. A.

Minute by Col. A. Galloway.

Until I read the above Minutes I certainly was not aware after so protracted a description, that the Board were not agreed as to what description of Canal this Circular Canal was proposed to be. I find however that the Members of the Board do not yet agree as to what Captain Prinsep's scheme was. Colonel Craigie says, "the Gates at Chitpore were never intended to be opened during the height of the rains: they are of the description called by the Chief Magistrate Floodgates, that is, quite obvious on an inspection of the model sent to the Board." "The Circular Canal would retain much of its advantages if constructed without any opening into the Hooghly as originally intended; but the communication with that River during the dry weather was certainly a great improvement on the original Plan introduced by Captain Prinsep* and approved by the present Superintendent.

On this the Chief Magistrate observes, that Colonel Craigie's remark is quite correct. "The works at the Chitpore end of the Canal have hitherto been described as Floodgates, not Locks," and the Chief Engineer adds, "the scheme, as shewn in Mr. Prinsep's model, is evidently intended to be Floodgates only."

If by this it be intended to embrace the opinion expressed by Col. Craigie above, that "the Gates at Chitpore were never intended (by Captain Prinsep) to be opened during the height of the rains," then certainly a misapprehension has taken place of Captain Prinsep's intentions: that gentleman having written many pages to show the advantages of his own scheme over that of Captain Schalh, by keeping the passage into the Hooghly open to navigation throughout the year! There is an whole essay† on what is termed "manœuvring the Gates." He tells us "the adoption of this method of artificial navigation (by means of his Gates) will secure a daily intercourse with the River throughout the year." That Captain Prinsep's Plan may be a bad one is another question, I think it so, and I have long ago objected to it, but his object is undoubted. If therefore the opinions of the Board already before the Go-

† See Appendix (H) No. 89, a.

* The communication with the River during the dry weather was an improvement not by Captain Prinsep I believe, but by Captain Schalh!

vernment, have been formed under an impression, that by the proposed scheme the Circular Canal *was not intended to be open to Navigation during the height of the rains*. Captain Prinsep's Scheme did in point of fact contemplate the Canal to be open to navigation throughout the year, at least for several hours daily, even in the height of the rains. It will perhaps be deemed necessary to afford some explanation to Government of the misconception.

Had I imagined that the Canal was not to be opened during the rains, it would have in a great measure removed some of the most obvious objections to it. But Government should not remain uninformed as to the different views, in this important particular,* we have severally taken of the subject.

A. G.

* I call the question of opening or not opening to Navigation the Circular Canal in the height of the rains important, because it is the only part of Captain Schalch's scheme of consequence, from which Captain Prinsep departs, whilst Captain Schalch, as quoted by Mr. P., explicitly states, that *the stability of my other Canals is built entirely upon their not being exposed to the Freshes of the River.*—A. G.

No. 96½.

Minutes of the Members of the Military Board, with reference to the Papers marked Nos. 95, 95a., 95½, in this Appendix.

Military Board's
Proceedings, 10th
July 1832.

I am quite of Mr. Prinsep's opinion that the Canal cannot interfere at all with the Drainage any more than did the Old Mahratta Ditch, and by the means of the Locks at the entrance, and the natural efflux of the Canal to the Salt Water Lake, it may be prevented from having any pernicious effects on the drainage of the City. In my memory I have known the Mahratta Ditch influenced by as high a tide as I have ever seen in the Hooghly, and I never heard of any inconvenience being experienced by it.

T. C. A.

Minute by Col. Sir
T. C. Anbury.

I have written a separate* Minute, to which I beg to refer.
13th July, 1831.

A. G.

Minute by Col. A.
Galloway.
* See No. 96, of this
Appendix.—J. M.

I agree generally with the Chief Engineer, the Chief Magistrate, the Superintending Engineer, and the Civil Engineer, that no danger is to be apprehended to the Drainage of Calcutta from opening the Canal into the River, according to the Plan which has been sanctioned.

Minute by Col. J.
Craigie.

There would seem, I think, to be a disposition to mystify the matter of the Locks or Gates. It may be proper therefore to explain to Government, that according to the Plan of Gates, proposed by Captain Prinsep and sanctioned by Government, they can only be opened during some months of the year, at certain stages of the tide. That although according to this plan a daily intercourse throughout the year will be maintained between the Canal and the River, for a certain portion of time, yet that the Board being anxious to render this great and important work as extensively useful as possible, have called on Colonel Tickell and Mr. Prinsep to consider and report whether the Locks cannot be so constructed as to secure a communication between the Canal and the River at all times of the day and tides, and at all seasons, without much adding to the expense of the work: that if the Board receive a favourable Report from Colonel Tickell and Mr. Prinsep on this point, they will have the honour to submit a Report thereon to Government.

The Chief Engineer and Chief Magistrate will determine whether their Minutes alluded to by Colonel Galloway are to go up to Government.

J. C.

26th July, 1831.

Minute by Col.
Sir T. C. Anbury.

I cannot consider the Canal in itself, or separately as at all influenced by the Hooghly or the Salt Water Lake, but as the Locks, or Flood-gates that are to be constructed between it and the River, may regulate it, and managed, as I imagine and suppose that they will be, and of course made to predominate for the special purposes of the navigation of the Canal at all seasons and times of Tide; the Canal under such management I conceive must be always efficient, and always under controul, and in consequence cannot in any injurious way affect the "Drainage" of the City, any more than it has heretofore been affected by the Old Marhatta Ditch.—The Locks are the only means by which the Canal can, I think, be rendered extensively or efficiently serviceable, and of consequence for the purposes of communication and traffic through the Eastern Canale, and I imagine, that, without the Locks, every benefit originally held forth, and intended from the Circular Canal will be annulled, and with them they will be obtained, without risk of impediment to the Drainage of Calcutta, but rather may be made to assist it, by affording the means of lessening the water in the Canal, when the level of the River may be below the mean level of the water in the Canal without any reference to that of the Salt Water Lake by the Locks; the influx or efflux of the River can be always so managed, and regulated, as never to endanger the bed of the Canal by its rapidity, and sufficient velocity can always be commanded to prevent or avert any superfluity of silt being deposited liable to injure the navigation. I have very attentively gone through Colonel Galloway's expanded Minute; but I do not discover any argument therein to weaken the original opinion I have formed on the advantages to be derived from the Canal, nor do I think I shall alter my sentiments unless occurrences, I do not at present contemplate, should take place, to produce a conviction in my mind quite contrary to present circumstances. I shall be glad to be informed by whom,* and since when, Sluices have been constructed at Bowanee-pore, and on the Marhatta Ditch, at Chitpore, and since the "Drains of Calcutta do *not* fall into Tolly's Nullah," why they have been placed at Bowanee-pore? I never remember in the course of 47 years ever to have heard that the City of Calcutta was threatened with "inundation." It seems by Colonel Galloway to be given, that the River is to have an uninterrupted flow at all seasons and times of tide into the Canal—no such matter is intended I presume, since the Locks or Flood-gates would regulate the communication between the River and the Canal, and the dissimilar levels of the Hooghly and the Salt Water Lake have nothing to do with the Canal when the Flood-gates or Locks are down. I have little veneration for what the late Lieutenant Schalch has advanced in any part of his Memoir. When the late Ruben Burrow's, Mathematical Teacher to the Engineer Corps, took the levels from Chandpaul Ghaut, (to the best of my recollection) he made the difference 12 feet; and would have opened the Mahratta Ditch from Chitpore to Tolly's Nullah and the Salt Water Lake but required Locks. Col. Watson, sometime Chief Engineer, and the late Sir Mark. Wood, while Chief Engineer, thought the scheme a good one, but it was not countenanced, and the levels became worthless, as well as the attempt at a Cut† through the Choggadah Nullah into the Sundurbunds. If the Locks are properly constructed, was there 100 feet weight of water, provided the Gates supported the pressure, the whole might be let through the Chambers successively, without stirring a brick. If the Canal is "favourable for the Drainage of Calcutta, in its present state," it will be precisely the same and infinitely more so with Locks at Chitpore, since the level of the Canal can be preserved exactly the same as at present, unless it is otherwise required. I had no objection to the model made by Mr. Prinsep of the Flood-gates: but as they would not answer the object I supposed originally intended, that of facilitating the navigation or passage of Boats from the Hooghly into the Canal, and *vice versa*, I am happy that locks are now intended, which is a very grand and judicious improvement, since it will render the Canal navigable at all seasons of the year; and I am moreover glad, that even at the eleventh hour, I find that, what I should have supposed was the view of the great designer of the Nullah or Canal in the first and original scheme,

* See Papers marked No. 13, and No. 13, *u.* in this Appendix.—J. M.

† See Papers marked No. 55, to No. 58, in Appendix to Appendix (G).—J. M.

namely, to have a perpetual ingress and egress is intended to be carried into effect. With regard to the impurities thrown into the Hooghly from the efflux of the Canal, no matter by what means, I do not imagine the water will be more foul than it is at present from the impurities that flow down the main stream, and are deposited daily and hourly on its Banks by the very people who *drink* its waters. By means of the proposed Locks, the costly undertaking will be brought to a conclusion, and in my opinion, accomplished in a masterly style. They may cost money; but they will be the only means of making the work perfect. The probable additional expense of constructing Locks in lieu of Flood-gates, compared with the relative advantages in such a grand work as this Canal, I conceive cannot be looked on as a matter of such great importance in any way, than thereby rendering the project efficient, and as money well laid out—There does not appear to me to be any necessity for going into a minute or detailed description of the advantages of Locks over simple Flood-gates, since every one at all acquainted with the construction of both; and their various appliances to Inland navigation by Canals, must be amply aware of their different uses, and separate advantages. I imagine it is no fault of the Board's that Government were not put in possession earlier that the Canal could not be an open Canal, without Locks, or some other means of regulating the water in the Canal, with reference to the River; and I moreover conceive, that cleaning out and widening the Mahratta Ditch would have answered all the purposes of this Canal, without a connection of the same with the River, and the noxious slime of the Salt Water Lake *might* have been brought up into the streets of Calcutta at a comparatively little expense to what has been now incurred. I think we should clearly state to Government, that *without the Locks*, or a *Lock and Sluice Gates*, which no doubt Mr. Prinsep's acquirements render him fully competent to design, the present Canal will become little better than an enormous Ditch, and may ultimately dwindle into such nuisance. Until we get the Report from Colonel Tickell and Mr. Prinsep, I have no objection to my Minutes going up to Government, inasmuch as they may make my opinion known (whether of *any value* or *not*,) on the subject: but I think we may well spare Government the reading of such a volume.

T. C. A.

On the 9th August 1831, Mr. Prinsep was requested to furnish, with his revised Estimate for Locks, an Estimate of the time that will require to pass a Boat through the Locks in the rains as well as in the dry season, but not having received a reply to this communication, Mr. Prinsep was again requested, 22nd Nov. 1831, to explain the cause of the delay, and the following has been received in reply. See No. 95½. of this Appendix.

It is with regret I state, that I think this Letter of Mr. Prinsep is very unsatisfactory. I observe that in consequence of his Letter of the 5th June to the Superintending Engineer (and the Report of the latter), in which Mr. Prinsep states "that the scheme proposed for the Circular Canal *never contemplated leaving open the communication with the river during the rainy season: indeed that it had been deprecated from the commencement even if no inconvenience were likely to occur to the Drainage; such damage would inevitably ensue to the Banks and bed of the Channel from the velocity and turbidity of the river water as would soon completely destroy the main object of the Canal, permanency of section and depth,*" meaning in plain words, *without completely destroying the Canal*, the "*main object*" of the Canal is the passage of Boats. It was not the intention of some members of the Board to shut up the communication during the rains: an explanation was called for from Mr. Prinsep as to the Locks proposed, and adverted to in the Superintending Engineer's Letter, now

Minute by Col. A. Galloway.

intended as it appears to be opened in the rains so as to admit the river. This was called for four months ago, and the present Letter is the information obtained, containing in fact no information at all. On the contrary we are informed, that a plan and model of a Lock-gate, prepared by the late Superintendent, for a Canal *not to be opened to the river during the rains*, has received the approbation of the former Committee and sanction of Government, and therefore Mr. Prinsep thought it less imperative to bestow his attention on a Lock-gate that is *designed to open to the river in the rains*, and that all we are to have is a slight modification of the former plan of the Locks. I consider the whole part of the opening as useless and hurtful. But since the orders of Government have been issued, I conceive it my special duty to see that the work to be executed, be fully and substantially adequate to the object. I am therefore disappointed after so great a lapse of time in finding the endeavours of the Board to obtain the information called for as so immediately required, in order that the plan may be carefully and leisurely examined before it be adopted, so fruitless.

A. G.

Minute by Col. J. Craigie.

Mr. Prinsep's Letter is certainly not very satisfactory, and does not exhibit much desire to attend to the suggested alterations of the Flood-gates. I observe this indisposition with regret, but I must at the same time observe, that the plan of Flood-gates already approved by Government, appears to me adequate to the objects designed to be secured by it. By the present plan of Gate, a communication between the Canal and the Hooghly will remain open during the whole day during certain seasons of the year: in the most unfavourable seasons of the year for communication, the passage will still be effected for several hours in each day, this is, all that the wants of the public will require, and therefore it appears to me that the present plan of Flood-gates will be found preferable to sets of Locks, because they will cost much less, and answer the wants of the community.

I think during Colonel Tickell's absence from Calcutta, Mr. Prinsep might send in his progress reports down to the Board. It is very desirable that the work should be completed during the present dry season.

J. C.

No. 97.

No. 379.

To CAPTAIN GAVIN YOUNG,

Secretary to the Military Board, &c. &c. &c.

SIR,

In obedience to the orders conveyed in your Letter No. 2999, dated the 13th instant, I have the honor to transmit direct for the inspection of the Board, a plan of the modifications which I propose to introduce in my brother's design for the Chitpoor Lock-gates.

2. The principal points in which the present plan differs from the original are as follows:—

3. The foundations are deepened from 4 to 10 feet under the bearing of the Gate Piers, and from 2 to an average of 5 or 6 feet for the floors of the basin and weirs. The actual depth which it may prove expedient to give to the substructure cannot however be prescribed until the nature of the soil below shall be exposed to view. Captain Prinsep, I believe, intended to avoid touching the expected stratum of oozing sand, but should this occur at 25 feet, it will, I think, be better to penetrate it in small portions, and create a spreading mass of grouted masonry upon it, than to leave a thin seam of clay between, which may afterwards

partially subside with the weight of the superstructure. The heavier the mass of foundations the less likelihood is there of their being affected by the walls above.

4. The superstructure is not much increased in scantling, but it is strengthened by counterforts; and by curvature of the profile of the walls.

5. The centre pier is increased from 8 to 24 feet in section: thereby rendering it in fact a double pier (connected by cross-walls), that the masonry of each set of Gates may be in a measure independent in itself, and in case of any settling of a partial nature, the effect may be confined to the spot; each set of Gates, sill, arched floor and piers being connected together by iron rods passing horizontally through the masonry, (as seen in the transverse section) so as to form but one piece, and to be subject to displacement only as such.

6. A second pair of small Gates is introduced within the Lock Chamber, upon the suggestion of Mr. McFarlan, to allow of the passage of Boats when the water of the Canal is higher than that of the River. There will however be a limit to their application, since, when the River is at its lowest level, the water in the Lock Chambers will hardly be sufficient to float any but the smallest description of Boats, and indeed at times the floor will be nearly dry.

7. Instead of two Drawbridges side by side, as originally designed with two fixed bridges over the adjoining Lock, I propose to substitute a single roadway with Drawbridges in succession over both of the Locks: increasing the width of roadway from 10 to 16 feet; this will render both of the Lock passages equally useful, and experience has shewn that a bridge of a single roadway is more convenient than a double one of twice the breadth.

8. I have also changed the position of the Drawbridge from the centre of the Lock Chamber to the inner pair of Gates; because in the latter situation it will be only necessary to raise the bridge during the moment of a Boat's passing in or out of the Chamber, whereas in the former position, it must have remained up during the time of entering and that of filling or emptying the water of the Chamber through the culvert or sluice.

9. It may however be a question since Suspension Bridges have been adopted everywhere else on the Canal, whether they should not be applied here also: and undoubtedly by making the bridge span over the innermost gates, and by giving a little additional height to the platform, the passage would remain free to all Boats which could pass under the other bridges, while the thoroughfare along the Chitpoor Road would remain unimpeded. The increase to the estimate would not be material.

10. One point I have not altered, although I am inclined to recommend it to the adoption of the Board. In the original plan, the Canal is everywhere excavated to the depth of 9 feet below the zero, or average level of the Lake, but the sill of the Gates is set only 7 feet below the same level. The neap-ebbs of the Hoogly in March and April sink to 5, 6, and occasionally even to 7 feet, leaving the floor of the lock nearly dry. Perhaps it may be preferable to give the same depth of 9 feet to the latter at once; and to make the outer Gate 24 feet high instead of 22. The inner pair of Gates need not be altered in height as it is but very seldom that the maximum height is attained, and then only for a short interval of the Flood-tide.

11. In the Board's instructions of the 9th August, I am desired to state what time will be occupied in filling or emptying the Chamber with water.

This of course depends upon the head of water outside and upon the section of the culvert or sluice. Assuming 8 feet for the average difference of level and 2×3 feet for the area of the passage, I calculate that about two minutes and a half will be required, independently of the manœuvring of the Gates.

12. In making the annexed estimate to accord with the alterations of the plan, I have been guided by the scale of charges in the original; the chief additions occur in the items of masonry, and Gates. The former is increased from 92,000 to 223,578 cubic feet. In

the latter the number of Gates is doubled, since the original seems only to provide for single Gates. In such a work the greatest latitude must be allowed for contingencies, especially where the nature of the ground is so little known, and there are no parallel works with which to compare the estimate, many items are, I think, rated higher than need have been, but I have purposely let them stand, and I should beg to recommend that the Board, should they think it necessary to apply to Government for the approval of the revised plan, should in general terms be prepared to incur an outlay not exceeding a Lakh of Rupees upon the Chitpoor Lock-Gates.

I have the honor to be.

Sir,

Your most obedient Servant,

CALCUTTA:

17th December, 1831.

JAMES PRINSEP,

Superintendent of Canals.

No. 97. a.

No. 12.

Estimate of the probable Expences of constructing a pair of double Lock passages for the Circular Canal at Chitpoor, according to the revised Plan and elevation furnished by Mr. JAMES PRINSEP, 17th December, 1831.

To Excavating in quantity 600 Chowkas @ 2/8 per Chowka,	.. ..	1,500	0	0
To Raising water, puddling against the oozing sand stratum, and keeping the work constantly dry, Estimated at most	.. .. .	5,000	0	0

MASONRY.

Cubic feet.

Foundation sides,	105 × 13½ × 10 × 2	28,350
Wings of ditto,	40 × 9 × 10 × 4	14,400
Ditto Central,	140 × 27 × 8 × 1	30,240
Floor, Arched,	105 × 21 × 6 × 2	26,460
Slopes A. B.	50 × 20 × 4 × 4	16,000
Walls-sides,	36 × 10 × 22 × 2	15,840
Ditto ditto,	42 × 6 × 22 × 2	11,088
Counter-forts,	4 × 7 × 22 × 10	6,160
Wings,	40 × 6 × 22 × 4	21,120
Do. Central-pier,	125 × 6 × 22 × 2	33,000
Counter-forts,	50 × 10 × 22 × 1	11,000
Bridge Piers,	18 × 6½ × 10 × 4	4,680
Wings,	24 × 4 × 10 × 4	3,840
Parapets,	24 × 2 × 5 × 4	960

223,138 @ 20 per o/o c. ft. 44,627 9 7

Stone of sills, grooves and coping [2500 worth in hand] say as much more required,	5,000	0	0
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Two Drawbridges, containing 1200 running feet of timber with Iron-work complete, say, 3-5-4 per running foot,	4,000	0	0
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Carried over,	60,127	9	7
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Brought forward,	60,127	9	7
Four outer pairs of Gates, 22 feet high 15 wide, each flap with timber grooves, aprons, brass crapandines, &c. coppered, @ 4-8-8 or 8/11 per square foot,	12,000	0	0
Two inner pair of Gates, 14 feet high 15 feet wide, ditto ditto complete, @ 11-14-5 or 5/7 per square foot,	10,000	0	0
Roadway of approach, &c.	2,000	0	0
Four Sluices with draw hatches for the culverts in the centre pier, ..	800	0	0
Eight Windlasses with chains, &c.	1,600	0	0
Ditto Lighter for inner Gates,	1,200	0	0
80 Saul timbers to fit grooves, @ 50 Rupees each,	4,000	0	0
Contingencies unlooked for, baling water, piling, staking, and Establishment, say,	6,784	6	5
Four Iron Lamp-posts complete, @ 100 Rupees each,	400	0	0

Total Sicca Rupees, 98,912 0 0

The cost of the last item of four Iron lamp-posts was missed in addition by Mr. Prinsep, which causes the large difference.

CALCUTTA, SUPDT. CANAL'S OFFICE:
28th December, 1831.

JAMES PRINSEP,
Superintendent of Canals.

No. 97½.

Minutes by the Members of the Military Board with reference to the Papers marked Nos. 97. and 97. a. in this Appendix.

The deepening or increasing the thickness of the foundations and the adoption of counterforts, I think absolutely requisite to a proper precaution, and in addition, if Mr. Prinsep has any doubts of his ground on which the foundation, and indeed all the masonry is to rest, I would recommend his satisfying such doubts by the use of the borer—the expectation of a “stratum of qozing sand” is a matter not to be treated lightly, and of course he will take his measures, and proceed accordingly. I would, if possible, be clear of any sand on which, or mixed with which, grouted masonry would afford me no confidence; grouted masonry is good under a foundation, but where a treacherous sand presents itself, I fear it would not altogether insure safety, no doubt can be entertained that the perpendicularity of the walls, and their efficiency depends greatly on the solidity and perfect level of the foundation.

I imagine that the walls are ample in substance, and of course counterforts will add to their strength and support, besides the curvature of the profile, which is a judicious plan, as well as the method proposed of constructing the Floors or sole of the whole.

I am not aware of the necessity of varying the heights of the Gates within the Lock Chamber, or that it will be any facility to the passage of Boats when the water of the Canal is higher than that of the River: the Chamber must be filled for the passage of Boats to the height either of the Canal or the River, and by the opening of the opposite Gates the Boats are discharged either way, unless the River should be lower than the sole of the Chamber, when it must be allowed to rise above the sole of the Chamber, to Floating depth for the Boats—at least this is my theory of the management of the proposed Locks.

Minute by Col.
Sir T. C. Anbury.

The arrangement of the passage over the Locks, is, I think, very good and convenient ; it may be matter of hereafter consideration, whether to recommend a Suspension Bridge or not. Under Mr. Prinsep's statement I should say that it would be desirable, although more expensive, in the first cost—the outlay would be saved in its durability.

I should recommend the sole of the Locks being laid at nine feet below the zero instead of seven, and for the reasons given by Mr. Prinsep, and I would make the Gates accordingly, and all the Gates the same. I do not exactly comprehend the advantage of the inner Gates being of less height than the outer Gates.

I imagine Mr. Prinsep has approximated as near the truth as possible in framing his Estimate ; but contingencies, many and various, must no doubt occur in such a work from impediments, from water collecting and consequent clearing of the same, possibly night-work, which must be paid for extra, and more contingencies than I can enumerate, and hope will not happen ; the ground will I trust be well examined ere the foundation is laid, and if that is done, I think there will occur few other difficulties or obstructions. I think tenders may be invited for the Gates, &c., or direct application for Estimates for them from the parties mentioned by Mr. Prinsep : for certainly the individuals mentioned are better acquainted with the practical construction of such work than any one else here, and will probably do them cheaper, and with better work.

T. C. A.

Minute by Col. J. Craigie.

The Letter from the Superintendent of the Canal, with the Plan and Estimate, should immediately be transmitted to the Superintending Engineer, L. P. for report. Colonel Tickell should be instructed to consider the subject involved in these Documents in all its bearings, and to submit a Report on the best mode of effecting a communication between the Canal and River, combining utility with economy. With reference to the opinion expressed by Capt. Forbes, of Engineers, in his answer to the questions of the Canal Committee, dated 24th October, 1828, "that without Dams, Tide-Gates, or Locks, the current entering or retiring from the Canal may, by various means, be made so to modify and regulate itself, as to admit of safe and convenient navigation at all times of the Tide, and at all seasons of the year," the Superintending Engineer should be directed to communicate with that officer, and to report whether any of the means alluded to by him, may not be preferable to any of the plans hitherto proposed for effecting the object.

(Sd.) J. C.

Minute by D. McFarlan, Esq.

I am disappointed with this Letter of Mr. Prinsep's, his present views are confined to certain emendations of Captain Prinsep's plan, which was apparently rather a feeler after the best, than one complete and compact in itself ; had he lived he would doubtless have suggested alterations and amendments, and discussed them so fully as to have enabled the Board confidently to recommend them. There are many views in which the question presents itself which need not to be fully discussed at this Board, and under the circumstances perhaps the only plan is, to send the papers to Colonel Tickell, through whom they would properly come before us. I question much, if any good is likely to come, of putting him into communication with Captain Forbes ; indeed the absence of that officer from the Presidency may lead to delay, and the direction should therefore be made contingent, and to be acted upon only if circumstances permit. It should not be forgotten, that Captain Prinsep's plan, such as it is, is already sanctioned, and that under the Chief Engineer's approbation, we shall not be wanting in our duty if we merely recommend the alterations. Mr. Prinsep I believe is about to make a rough model, which will facilitate a due understanding of the subject.

D. McF.

No. 98.

No. 3503.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board, to transmit to you for Report the accom-

panying Letter from Mr. Prinsep, dated 17th ultimo, with the papers connected with it noted in the margin,* together with two Plans of the Tide-Gates.

Replies to the Queries addressed by Captains Forbes, Colvin, and Fitzgerald, Mr. J. Kyd, and note of Major Taylor.

Letter of Major Jackson to Secretary Prinsep, of 19th November, 1827.

Memoir of the late Capt. Prinsep.

Letter from Secretary Prinsep, dated 6th December, 1827.

Letter from James Prinsep, Esq. dated 25th November, 1831.

Letter from Do. Do. 17th December, with the Estimate and a plan by the late Capt. Prinsep, Ditto one by Mr. Prinsep.

The Board request you will submit a Report on the best mode of effecting a communication between the Canal and River, combining utility with economy. With reference to the opinion expressed by Captain Forbes, of Engineers, in his answer to the questions of the Canal Committee, dated 24th October 1828, "that without Dams, Tide-Gates, or Locks, the current

"entering or retiring from the Canal may, by various means, be made so to modify and regulate itself, as to admit of safe and convenient Navigation, at all times of the Tide, and at all seasons of the year." You are requested to communicate with that Officer and report whether any of the means alluded to by him may not be preferable to any of the Plans hitherto proposed for effecting the object.

I have, &c.

(Sd.) G. Y.

17th January, 1832.

P. S.—The Original paper to be returned with your reply.

* See Appendix H. Nos. 89 a, 95 a, and Nos. 107 to 111.

No. 99.

No. 2460.

FROM LIEUTENANT COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

TO CAPTAIN G. YOUNG,

Secretary Military Board.

Canals.

Barrackpore: 29th February, 1832.

SIR,

I have the honor to acknowledge the receipt, on the 21st, of your Letter No. 3503, of the 17th ultimo, and several enclosures, relative to the proposed Tide-Gates at the entrance of the Canal near Chitpore; and having personally communicated with Captain Forbes and Mr. James Prinsep on the subject, beg to enclose copy of a Correspondence, as

* From Superintending Engineer to Mr. Prinsep, No. 2199, of the 2nd February 1832.

From Mr. Prinsep to the Superintending Engineer, No. 393, of the 11th February 1832.

From Ditto to Ditto, No. 396, of the 22nd Ditto.

noted in the margin,* with the latter Gentleman, with whom I entirely agree as to the necessity of constructing a Lock at Chitpore, as originally intended by his predecessor, the late Captain Prinsep, all the works connected with the Circular Canal having been constructed with a view to such

a measure, in order to maintain the level of the Canal at a height not exceeding 9 feet above zero.

2nd. I would therefore recommend the adoption of the plan suggested by Mr. Prinsep in the 15th paragraph of his Letter No. 393, that of substituting a single Lock of 30 or 32 feet in breadth for the two Locks of 24 feet each, not only as being the least expensive, but as throwing open a direct communication with the Sunderbunds to the River Steamers, and for the several other reasons stated by Mr. Prinsep, all of which I think are good arguments in favour of the measure. The want of a second entrance may possibly be felt hereafter, but in that case, another of smaller dimensions, calculated for River Craft, may easily be built at any time adjoining that now proposed, the site of which may be so selected so as to admit of such addition without inconvenience or difficulty.

3rd. Various modes, no doubt, might be proposed for shutting out the River at Chitpore, without the intervention of a Lock, but they would all, most probably, be found nearly as expensive, and their efficacy, from being untried, very uncertain. The Floating-Gate suggested by Captain Forbes is one of these, but even had it been brought to perfection, it could not have been adopted on the present occasion, with reference to the height of the new Suspension Bridges; being intended, not so much to regulate the level of the Canal inside, as to check the velocity of the current at the entrance Chamber.

4th. I herewith beg to return the two plans, and several documents received with your Letter under reply.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Lt. Col.*,

Superintending Engineer, Lower Provinces.

No. 99. a.

No. 2199.

FROM LIEUTENANT COLONEL R. TICKELL.

Superintending Engineer, Lower Provinces

TO JAMES PRINSEP, ESQ.,

Superintendent of Canals.

SIR,

Barrackpore: 2nd February, 1832.

Having been called on by the Military Board to submit a report on the best mode of effecting a communication between the Canal and River, combining utility with economy, I have to request that you will favor me with your opinion on the following points:

1st. Whether or not you consider a Lock and Gates, such as you have lately proposed in your revised Plans and Estimate No. 12, of the 17th of December last, indispensably necessary for maintaining the Navigation of the Canal; or whether or not you are of opinion that inconvenient or dangerous consequences would result, were a secure entrance Channel, equal in area to the intended Lock Chamber, left open to the Hoogly?

2nd. Should you have any doubts on the latter subject, whether you do not think that, during the ensuing rainy season, you could conduct such a set of experiments as would afford tolerably sufficient data for estimating the effects that such an influx of water would produce on the banks of the Canal, on the Canal itself generally, on the level of the Salt Water Lake, and on the property adjacent to it, and to the line of Canal?

3rd. Whether or not you believe that the navigation between the Canal and River could be maintained by means of Log Dams or other contrivances, without the intervention of Locks?

4th. Whether you consider the Lock proposed could have its foundation laid in the sandy soil at Chitpore, at the depth planned of forty-four feet below the surface, without the aid of a powerful steam engine?

I have, &c.,

(Signed) R. TICKELL,

Superintending Engineer, Lower Provinces.

No. 99. b.

No. 393.

FROM JAMES PRINSEP, ESQ.,

Superintendent of Canals.

TO LIEUTENANT COLONEL R. TICKELL,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 11th February, 1832.

I have the honor to acknowledge the receipt of your Letter No. 2199, dated the 2nd instant, calling for further information on the subject of the Circular Canal; to which I beg leave to reply in the order of the questions referred to me.

2nd. The object of introducing Locks in the scheme of the Circular Canal was three-

fold: namely, 1st, To secure the drainage of the Town from injury by the raising of the Salt Water Lake and Canal levels;—2nd, To prevent the destruction of the Banks and Bridges by the current of water in the rains, which Major Schalch estimated at three and a half miles per hour; and Lastly, To protect the Canal from the effect of the silting expected to ensue on the admission of the turbid River water, which Major Schalch (upon Major Rennell's authority) assumed to contain *one-fourth of its weight* of sand.

3rd. The last objection is of no value, since the statement upon which it is founded is altogether erroneous, and a greater danger is now proved to await the Canal from the silt deposited by the City Drains, which a current of River water would, in some respects, diminish.

4th. The second objection is not of much avail either, since it does not appear that the Banks of Tolly's Nala are cut away, nor its Bridges undermined, although the current from the River is as strong as it need be in the new Canal; for, by contracting the entrance sufficiently, the current in the latter may be placed precisely on the same footing as in the Tolly's Nala.

5th. The first objection is of more serious consequence, as it is obvious that, wherever the water may be raised to more than ten feet above the zero, it will be even with the Circular Road, and will entirely prevent the Drainage of a considerable portion of the Town, *while it continues at that elevation*. In the Appendix to Major Schalch's Memoir it is shewn, that at high-water spring Tides, when the Tide entered freely into the Marhatta Ditch, and flowed through it to the Salt Water Lake, the surface of the stream at the Sam Bazar Bridge was only six feet ten inches above the Lake level, while it was nine feet six inches in the River, and only three feet at the Bridge on the Dum-Dum Road; the opening of so small a Channel, therefore, as the Marhatta Ditch, could only injure the Drainage of the immediate neighbourhood of Chitpore, which could be obviated by carrying the Drains onwards separately from the

Ditch, and making them fall into the same Ditch beyond the Dum-Dum Road, at a part where the level was but little influenced.

6th. The same thing may still be done; last year, in fact, it was done; for the Dum-Dum Road Drains having been blocked up by the earth of excavation, the only exit for the drainage of the Marhatta Ditch was by the Ooltadunga Tunnel Drain; at this point, it will

† See No. 95a. of this Appendix, p. lviii.

Copy forwarded with my Letter† No. 444, of the 14th of June last.

be seen by my Letter* to your address of the 5th June last, the water of the Canal, if open to the River, would have an elevation of about six feet above zero, leaving three or four feet for the slope of water in the Drains; this calculation depends upon the admission of River water by a Channel *equal in area to the Chamber of one Lock*, or twenty-four feet wide; and some modification is necessary to adapt it to the contingency of leaving the whole section of the Canal freely open to the River. To suit the latter case, it may be assumed, that the level of the River in the freshes is eight feet higher than the Lake level, and that the section of the Tarda Nala at its exit from the Lake is of the same dimensions nearly, as the Canal of supply; then, the rise of the Lake level may evidently reach one-half that of the Hoogly: namely, four feet above zero, and if the distance between the Lake and the River be supposed a continuous slope, then the elevation of the surface of the Canal at the mouth of the Ooltadunga Drain would be *seven feet above zero*; not differing more than a foot from the former Estimate: at the height of the spring Floods, undoubtedly the water would rise four or five feet higher, but this would form only a temporary inconvenience to adduce an instance of similar circumstances.

7th. The southern part of Chowringhee and the Suburbs of Bhowanipore, &c., are Drained into Tolly's Nala at a spot two miles distant from its mouth in the Hoogly, where, if I understand the Tables of Tides, Registered by my brother, aright, the surface of the water in the Flood-tides of September stands *twelve feet above zero*, or higher than the general level of the Circular Road. The mean height, or *mean of low and high water* at the same season is, however, only *seven feet above zero*, leaving a fall of two or three feet from the Circular Road; and this is, no doubt sufficient to draw off all of the rain water, although there may be a partial reflux through the Drains, during part of the Flood-tide. The position of the Manicktola Drain resembles precisely that just described, and the Drainage of all places southward of this point would be as feasible as that of Bhowanipore. Having no personal experience of the actual state of the Drainage in that neighbourhood, I cannot speak of the inconvenience which the tardy flow of the water may cause, and, before finally drawing conclusions, it would be advisable to examine fully into this point.

8th. I am disposed, therefore, on the whole, not to consider the Drainage of the Town an insurmountable objection to the throwing open the Canal to the River; such a measure would undoubtedly prevent the free discharge, which now takes place from the Drains (greatly to the detriment of the Canal), but the Town would still be cleared of water with sufficient rapidity to prevent any actual inundation.

9th. There are other inconveniences, however, attendant upon the proposed measure of opening the Channel, besides that of injury to the Drainage; one of these is the height of the Bridges of Suspension, these have been constructed on the idea of the level of the Canal remaining at *nine feet above zero*, and they would not allow of the passage of large Boats were the level much raised. The Bridges over Tolly's Nala are more elevated than those of the new Canal.

10th. The experiment suggested might certainly be made, although I think that the result of the measure may be calculated sufficiently well without. Moreover, as it would not be prudent to open more than a small section (equal in area, say, to one Lock Chamber) the velocity of the stream at the mouth would act considerably upon the Banks at this place, and would wash a great quantity of deposit into the Chitpoor basin.

2ndly. Whether an experiment may not be tried by the admission of a stream the next rains?

11th. There would be no danger to the Canal Bridges, as the Barrackpore and Dum-Dum Bridges were purposely laid much deeper than originally designed, and the others are situated too far off to feel any evil consequences.

12th. The object of the Log Dam proposed by Major Scholch as a substitute for Lock-

3rdly Whether the navigation between the Canal and River could be maintained by Log Dams, or other contrivances, without the intervention of Locks

Gates, was to shut off all communication between the River and Canal during the rains, and certainly with such a contrivance, all navigation must be suspended pending its application.

13th. The substitution of a Floating Gate to check the velocity of the current proposed by Captain Forbes would not, in my opinion, be productive of any benefit. The Boats necessary to lift the float must necessarily take up a greater part of the opening and impede the navigation: the expence of the masonry and apparatus would fully equal that of the Lock itself, while its efficacy is, in my opinion, very doubtful. I have not estimated the resistance that would oppose the lifting of the Gate, but it is capable of strict calculation.

4th Whether the foundation of the Lock could be laid without the aid of a Steam Engine

14th. On this point, I can now speak with certainty, as the excavations for the Lock have been carried down to the level of the sill of the gates, and the earth proves to be a good consistent clay, so that there will neither be occasion to carry the foundations to any thing like the depth mentioned in your letter, 44 feet;*† nor to adopt any measures for removal of the

*The depth in my plan was 22 + 10 = 32 feet

[†I measured to the Roadway at the Bridge, which it appears rises 10 feet there]

R. T

relinquish the Lock altogether, and only to construct a secure entrance Channel of masonry (which must be so much the stronger, that it will have to cope with the constant corroding action of a rapid stream), still not a moment should be lost in laying down the foundations at the present season, and as the stones for the sills of the Gates are all ready cut, it will cause no additional expence to make preparations as though the Gates were to be erected.

15th. If it is the great expence of completing the Locks, which has led to a discussion in the Board as to the possibility of doing without them altogether, I beg leave to submit that one measure suggests itself as certain to reduce the expenditure perhaps as much as one-half, while it will allow of a trial of the free passage system without producing any injurious elevation of the Salt Water Lake: it may also be the means of opening the upper Sunderbund passage to the River Steamers. The plan I allude to, is to substitute a single Lock of thirty or thirty-two feet in breadth for the two Locks of twenty-four feet. It is possible to make the stones prepared for the latter suit the former, and the plan and design furnished for the one may equally serve for the other on a scale somewhat enlarged. Should the free passage be found convenient, the gates may be opened or removed altogether, the small back gates at any rate will be found serviceable in preserving a depth of water in the Canal during the dry season.

16th. On this important point, however, I must beg for immediate instructions, as I have hitherto proceeded on the plan already sanctioned by Government; and I am now prepared to excavate the foundations at Chitpore accordingly.

(Signed)

I have, &c.

JAMES PRINSEP,

Superintendent of Canals.

No. 99 $b\frac{1}{2}$.

No 396

FROM JAMES PRINSEP, ESQ.

Superintendent of Canals

TO LIEUTENANT COLONEL R. TICKELL,

Superintending Engineer Lower Provinces

SIR,

Canal Office: 22nd February, 1832

* See No 13a
page xvii of this
Appendix.—J. M.

In continuation of my Letter of the 11th instant (No 393), I beg leave to state, that I have examined the Drain* which runs from the south-east corner of the Chowringhee Road to Tolly's Nala. It is a very considerable Drain, about equal in magnitude to the old Marhatta Ditch; it empties itself into the Nala at $1\frac{1}{2}$ mile from its mouth in the Hooghly, and the Tide from the latter, in the rains, rises almost even with the level of the Road or Banks of the Nala. There is a double Sluice Gate to prevent the water of the Nala at these seasons from entering the Drain, but it is of little use, because the Drainage water in the meantime accumulates so fast as to raise the level of the water *behind* the Gate, even with that in front of it. At high water, I am informed, the Drain at the corner of the Chowringhee Road is also filled nearly to the surface, but the inhabitants of that part of the Town do not remember any inundation ever taking place.

2nd. If I understand that you have requested my opinion as to the necessity of completing the Locks of the Circular Canal, according to the original intention of the designer, I beg leave to subjoin to my former observations, that, although the existence of the Locks is not indispensable to the Drainage or to the maintenance of a Canal communication, still, with respect to the actual state of things, the construction of the Bridges, Banks, Roads, &c., I consider it necessary to preserve the level of the Canal below the coping of the revetment walls of the Bridges; otherwise very few Boats will be able to pass under them; and the completion of the Lock alone puts it in our power to command this essential point. I think, therefore, there should be no hesitation nor delay in carrying it into execution at once.

I have, &c.

(Sd) JAMES PRINSEP,
Superintendent of Canals

True Copies

R. TICKELL,
Superintending Engineer Lower Provinces

No. 99 $\frac{1}{2}$.

*Minutes by the Members of the Military Board with reference to the
Papers marked Nos. 98. 99. 99 a. 99 b. and 99 $b\frac{1}{2}$. in this Appendix.*

Minute by Col. Sir
T. C. Anbury.

I am decidedly of opinion, that the Canal will be of little worth without the Locks, by which to afford a ready communication with the Hooghly, and I agree nearly in all Lieut.-Colonel Tickell has shewn on the subject, save that of *now* constructing a single, while the contingency of a second Lock, though of smaller dimension, may be hereafter required, merely on account of the present expence: the measure of constructing another Lock, (if I understand Colonel Tickell aright), abreast of the single Lock, I think, in the attempt, may prove danger-

ous, inasmuch as in excavating for another Lock in such a position, might tend to weaken the work of the first erected one throughout, and I think might be particularly injurious to the foundation: but if it is contemplated to make a second at a moderate and convenient distance from the first, I think the plan judicious, and affording many advantages, it may not be here necessary to enter upon at length. I am decidedly of opinion after very attentively perusing Mr. Prinsep's Letter, that the Lock, either double or single, is essential, and that every advantage to the complete navigation of the Canal may be expected as the result of the plan being carried into effect, the free communication of a current from the Hoogly and vice versâ through the Canal from the Lake one way, or even both, may dissipate the silt, or filth from the drains, and whatever other matter may be collected in the Channel of the Canal. By the Locks I conceive that the water can be retained at any required height above zero. Of Captain Forbes' plans for a floating sluice I cannot say any thing: because I have not seen the plan; or the scheme of it explained. I think there is not any time to be lost in having the work accomplished, and I have only to suggest, which I hope has been already anticipated, that the soil on which the work is to rest, be thoroughly probed, and its tenacity ascertained, on all else I think Lieutenant Colonel Tickell has afforded all the information required.

T. C. A.

Since receiving the newly circulated papers, I have conferred with Mr. Prinsep himself on the subject; he concurs with myself in thinking after all, that the idea of admitting steamers into the Circular Canal must be abandoned, first their funnels must be very low indeed to admit of their passing under the Bridges, 2nd the Canal must be cleared of every other description of Boat, a tyrannous sort of procedure not easily carried into effect, and 3rd, the Entally Canal would not have water enough. The idea of steamers being therefore abandoned, the enquiry necessarily comes, why have so wide a Chamber as proposed in the 15th paragraph of Mr. Prinsep's Letter: the objections to very large Chambers are the expensiveness of masonry, and especially of the Gates, the cumbrousness, and difficulty of working very large Gates, and the extra time that must be consumed in filling and emptying them. Upon these considerations I found Mr. Prinsep willing and anxious to have small Locks of 24 feet.

Minute by D.
McFarlan, Esq.

The Locks which he has proposed in his revised Estimate are double, that is, two abreast with each, one Chamber and four Gates, differing only from those already sanctioned by having one small Gate, the advantage of which is great, and the expence very trifling, the great increase in the Estimate arises from strengthening the works originally proposed.

My view is, and Mr. Prinsep concurs, that at present we should recommend only one Lock, not a double one. My reasons are, that the more I consider the matter the less satisfied am I, that Locks are required at all—in deference however, to general fears, and with reference also to a certain quantum of positive benefit which will accrue from a Lock, in the height of the freshes and perhaps at other times also, I think we should have one Lock, the expence of which will be only one-half of the two Estimated for. Mr. Prinsep assures me, that means can be taken to allow of a second being added, should future experience show it to be at all desirable.

I have inspected Mr. Prinsep's model, which is made of stone, brick and wood, and represents in every item what the work will actually be. I have seen Captain Forbes' scheme adverted to by Colonel Craigie, than which nothing can be more unlikely to answer any good end, and which must be greatly more expensive than Lock-Gates.

D. McF.

The impression on my mind is, that the Gates in the end will be dispensed with altogether. Already we have Mr. Prinsep's reporting that two of the reasons which indicated the

Minute by Col. J.
Craigie.

* See Appendix J
Nos. I and II.—
J. M.

expediency of their construction, are no longer influential, and the obvious leaning of his mind is, that the third reason may also be disregarded. We certainly in the instances of Tolly's Nullah and the Marhatta Ditch, have experienced,* that no serious evils have been sustained from the free ingress and egress of the waters of the Hooghly into these Channels. Under these circumstances I think the expence to be incurred in the construction of Gates should be as limited as possible, and that in the first instance only one set should be erected. The circumstances which oppose the admission of Steamers into the Canal, as stated by the Chief Magistrate, appear to me conclusive on that point. I therefore think it would be inexpedient to increase the width of the opening to thirty or thirty-two feet, as proposed under an expectation that the Canal might be made available for Steamers. By restricting the work in the first instance to one Lock of twenty-four feet, we shall greatly reduce the expence of the undertaking, and secure at the same time such extent of advantages as prudence seems to dictate, with reference to the Drainage of Calcutta. Another Lock can of course be constructed abreast of the first one hereafter, should experience show it to be necessary. I have never for a moment thought that an opening into the Hooghly, either with or without Locks, should be dispensed with.

As the stones and materials for the construction of one Lock would seem to be in readiness, Mr. Prinsep should be instructed to proceed with its construction, with the utmost energy: the season is far advanced, and he has requested immediate instructions. The description of the ground for the site is very satisfactory.

J. C.

No. 100.

No. 2991.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO COLONEL T. WOOD, C. B.,
MAJOR IRVINE,
CAPTAIN FORBES.

GENTLEMEN,

I am directed by the Military Board to acquaint you, that you are appointed a Committee for the purpose of examining and reporting on the state of the Circular Canal, its Bridges, Roads, and Drains, and the works connected with it, their present condition, and in the event of a current from the River being admitted generally, you will be pleased to Report your opinion on whatever may appear to you deserving of notice as to the state of the Canal.

Captain Baker and Mr. James Prinsep, who will attend your Committee, will be directed to furnish you with whatever plans and information you may require.

I have, &c.,

(Sd.)

No. 101.

To CAPTAIN YOUNG,

Secretary to the Military Board.

SIR,

Having, as directed by your letter of date the 13th ultimo, examined the Circular Canal, its Bridges, Drains, &c., we have the honor to Report—

1st. That with the exception of the Boitacanna Bridge, not at present dangerously insecure, we consider the Bridges crossing the Canal, notwithstanding several cracks observable in the masonry, as sufficiently strong, and otherwise duly calculated to answer the purposes for which they were erected.

2nd. The suspension chains of the Boitacanna Bridge, we would recommend should be removed from the upper partially cracked piers now sustaining them, and that these piers from the level of the roadway upwards should be rebuilt.

3rd. Conveniently compatible with such rebuilding of the piers, would be the adoption of a suggestion of the Superintendent for raising the level of the roadway of this Bridge one foot or so, as to bring it to the same clear height from the water, as the roadways of the other Bridges.

4th. By temporarily supporting the roadway from below, as further proposed by the Superintendent, we have reason to believe these alterations may be effected without material stoppage of the intercourse by the Road from Calcutta to Balliaghaut.

5th. We would recommend that the Superintendent of Suspension Bridges should be authorized to give the ironwork of these Bridges a coat of paint annually.

6th. The Roads projected parallel to the line of Canal being as yet unfinished, save on the City side, from the Intally Canal to the Ooltadungah Drain, we have only to remark, that from the mode of construction adopted in forming them, they cannot be expected to be of a superior description to those usually met with in the vicinity of Calcutta.

7th. Having ascertained from soundings taken in the course of our Survey, that a large quantity of mud and filth, had been brought into the Canal by the drains entering it from Calcutta, we, from these soundings and from numerous similar measurements previously made by the Superintendent, requested him to furnish a statement of the quantity of soil thus annually deposited. From the annexed detail in consequence prepared, it appears, that during the rains of last season alone, the mass cast down by eight Drains, the total number entering from the City amounted to 883,000 cubic feet.

8th. From this fact and from the Estimate furnished by the Superintendent, of the capabilities of the dredging machines (worked by manual labor,) employed on the Canal, it becomes apparent, that to preserve the navigation permanently open, five such machines, at an annual expence of 15,000 Rupees would be required.

9th. Although at variance with the possibility of keeping the navigation permanently open, we conceive that until the profits derived from the Canal may warrant the expence of a more efficient mode of remedying the evil, it will be expedient (after the rains of each season,) to have Bunds thrown across the Canal, and to have the soil raised by "hand," a mode of procedure which the observation of the Superintendent shows would be most economical, and still more easily practicable after the entrance Locks are completed.

10th. The effect of the Lockage water admitted by these Locks, will doubtless be to disperse more uniformly over the bottom of the Canal the soil now accumulated in nearly impassable shoals at the entrances of the Drains.

11th. The effect of the free admission of the water of the Hooghly, would probably be to move these shoals (in less inconvenient forms) into the Balliaghaut Canal, or that portion of the line of Canals joining the Circular Canal, and the branch crossing the Salt Water Lake.

12th. In the original planning of the Circular Canal, we conceive that provision should have been made for carrying the contents of the Drains alluded to, into the Salt Water Lake by a line which turning to the southward, and partly coinciding with that of one of the Drains of the Circular Road should, after having passed clear of the Intally Canal, have turned to the eastward, and have extended (nearly parallel to the Ballaghaut cut) into the Lake.

When the profits of the Canal will warrant the expenditure, such an obviously beneficial alteration would involve, we doubt not it will be adopted

We have the honor to be, Sir,

Your obedient Servants,

T WOOD, *Colonel, Engineers*

A IRVINE, *Major, Engineers*

W. N FORBES, *Captain, Engineers*

No. 101 $\frac{1}{4}$.

Estimate of the quantity of Soil deposited in the Canal during the rains of 1831, by the several City Drains.

	Cubic feet
The two Drains of Bontacanna Road	75,000
The Scaldah Drain,	210,000
The Narkooldanga (or Muchwa Bazar) Drains,	288,000
The Manicktola two Drains,	120,000
The Ultadunga Drain,	195,000
Total,	883,000

The average length of the main Channels may be called 2 miles without counting branches, the breadth of the bed upon an average say 5 feet, then the above amount of deposit would fill them to a mean height of 3 feet 4 inches. But to make a fair estimate it would be proper to enquire from the Conservancy Department how much *muttee* was generally removed per annum from the Drains, and to examine what proportion of deposit used to take place at the mouths of the Drains in the Salt Water Lake. The deposit for 5 years in the Calcutta Canal, chiefly derived from the Dhurmtulla Drain, has been 2,000,000 cubic feet, or 400,000 cubic feet per annum, which proves that the above are by no means overrated.

CANAL OFFICE :
29th December, 1831

(Signed) J. PRINSEP,
Superintendent Canals.

No. 101 $\frac{1}{2}$.

The work of two dredgers is stated in the abstracts for 1829-30, to be 800,000, but in reality I would think it was about half that quantity, and in this case four such dredgers would be required constantly at work to remove the deposit annually, and one extra Boat would be required to take the place of any out of repair. The annual expence of the Dredging Boats employed at present is Rs. 6,000, or 3,000 each. The total expence of dredging would therefore amount to 12 or 15,000 Rupees annually. It would be much cheaper to throw Bunds across and take up the *muttee* by hand, especially since the Locks will enable the greater part of the water to be drained off at low water neap-tides in the dry season into the Hooghly.

(Signed) J. PRINSEP.

No. 101 $\frac{1}{2}$. a.*Minutes recorded by the Members of the Military Board, with reference to the foregoing Papers, marked Nos. 101 to 101 $\frac{1}{2}$ inclusive.*

[Committee's Report on the Works of the Canal Department.]

I am of opinion, that the work proposed by the Committee, whose Report is now before us, (2nd para.) should be immediately executed, and that the suggestion by the Superintendent, as stated in 3rd para. should be adopted. If the Bridge Roadway can be raised without impeding the communication, or passage over it, *tant mieux*. The ironwork of the Bridges would no doubt be the better for painting, as it would preserve it—the mode of forming the Roads is not mentioned. I am very sorry to observe that the Committee's Report generally on the state of the Canal is not all that I had hoped it would have been; and more sorry am I to see that the Superintendent's opinions lean towards the probability of its incurring a very heavy annual expence to keep it open; and that resort must be had to separate means of carrying off the drainage of the city. It might have been expected that much of the sludge and silt from that drainage going into the Canal without a current to carry it away, would consequently create partial obstruction. This should have been foreseen, and guarded against, and methods originally adopted to avert such inconveniences which must now be resorted to, incurring heavy expence, and equally considerable inconvenience. The quantity of deposit as stated in the Report, is vastly in excess of what I could have imagined in one season of rain, and if this is not in due time removed, will not only increase the difficulties of the navigation, but also the expence in clearing it hereafter; and if neglected, the shutting up in toto may be expected. I am not quite satisfied that Dredging Machines are efficient remedies, or that they can work with sufficient effect near to the Banks or sides of the Canal; the expenditure thereon, as appears by para. 8 of the Report, is in my opinion enormous, and whether likely to be defrayed by the Tolls on the Canal or not, those who are concerned in the collection of them will be best able to answer. The 9th para. seems to be nearly if not quite a death blow to the concern altogether if the delay in adopting the more efficient means of keeping the Canal open is protracted until the whole is so blocked up, as to require an expence equal to re-excavating, and if the probability of the funds arising from the Tolls being adequate to the required amendment is not speedily ascertained, the Canal may be shut up, and the Tolls, as a certain consequence, also at an end. The expedient of making Bunds across the Canal for the purpose of partially clearing away the shoals occasioned by the deposit from the Drains, seems to me to be very exceptionable—in the first instance the expence will be heavy, and during the operation the navigation must be stopped, and the disposal of the soil not easily provided for, the operation must be repeated periodically, incurring an eternal expence: that it will be “most economical” I am not prepared to believe, notwithstanding the authorities from which the assertion emanates—that the work must be done somehow, there seems to be no question, or all that has been expended is thrown away. I am nevertheless of opinion, that if the Locks are constructed, this Bunding plan may be rendered unnecessary, and para. 10 tends to corroborate my opinions. It was an ill-judged measure in my humble conception to lead the Drainage into the Canal in the first instance, without considering what deposit was likely to be the consequence, and without a knowledge whether Locks would or would not be adopted, and whether any increase of soil at the sole of the Canal could thereby be removed. Whether the Lockage water will have a sufficient fall from the Locks towards the Salt Water Lake, to disperse more uniformly the soil accumulated from the Drains, must be determined by the periods at which the Lockage water is employed,

Minute by Col. Sir
T. C. Anbury.

Minute by Col.
Sir T. C. Anbury.

and the experiment of how long it can be kept in force, and that again depends on the height and periods of the tides in the Hoogly when the gates are opened, and the Locks applied to the purposes required of them, the free admission of the water of the Hoogly at particular seasons, indeed almost at all seasons is quite essential to the existence of the Canal, and to its having an uninterrupted navigation, but if the effect is only to be the removal of the present shoals occasioned by the Drainage of the City, into more convenient forms, much is not I think gained, and we may hereafter have to complain of the shutting up of the Ballaghaut Canal (and the Intally Canal also), and the communication with the Salt Water Lake without continual Dredging. I am disposed to think with the Committee, that the drainage of Calcutta towards the Salt Water Lake ought to have been a subject of prior consideration, and might have been otherwise provided for, or in the way suggested by the Committee, though I am not prepared to say how that would answer in the absence of a line of levels in that direction, although it would be a long and great distance. I do not conceive it impracticable, as far as my observation has gone, to have made a Cut, exclusively for the drainage into Tolly's Nullah where the great falls of the tide are advantageous to great drafts and to drawing up any drainage into it, and against extraordinary spring-tides during the freshes in the Hoogly, a single Flood-gate would be sufficient if at all required, having no levels, I can only judge from appearances. If the revenues of the Canal or the profits arising from resale of the ground, on its Banks should prove sufficient, I should think such funds could not be better or more advantageously appropriated than to the purpose of relieving the Canal from the drainage and sludge of Calcutta, not any notice is taken of the proposed Plan of Locks or the advantages to be derived from them with regard to the navigation of the Canal, although I think the observations in the 10th and 11th paras. is much in their favour. I think the Report should go up to Government ere we propose any thing.

MILITARY BOARD OFFICE :

(Signed) T. C. A.

The 23rd January, 1832.

No. 101½. b.

Minute by D.
McFarlan, Esq.

I have not been able to find any data that would lead me either to suspect the accuracy of the Superintendent's computation of the amount of deposit, or to trust to it very implicitly. The matter is not of much consequence, since whether the deposit be great or small, it must ultimately be removed. I may remark, that as far as can be ascertained, there is no material reduction of the amount of deposit in the Drains of the Town, and it would follow that this 883,000 cubic feet of soil, must have been annually disgorged into the Drains leading to the Lake and the Lake itself.

It is computed, that the above quantity of soil would cover about 61 beegahs of ground, to the depth of one foot. The bottom* of the Canal, from the Chit-pore Road to the Salt Water Lake may be estimated at Beegahs 108-15.

* Length 29,000 feet
Breadth 4 feet

Supposing that a current let into the Canal would sweep away half the deposit, we should have a deposit of three inches and one-third annually on the floor or bottom of the Canal.

But before founding any proposition on, or adopting as correct this Estimate of deposit, we ought to have the data on which it is founded stated more specifically. I imagine that there is more than one year's deposit here, and I know also, that there was much earth washed away from the sides of some of the Drains, between the Circular Road and the Canal. The side of the Canal also will have been more worn during the first year, than they will be hereafter, when the earth is consolidated and the banks covered with verdure. It is the more necessary that we should be particular on these points, in order that doubts may not be thrown on the success of an important and public work needlessly.

In regard to the deposit that will be swept into the Lake by a current, I see no reason to apprehend serious inconvenience—were not much of what has been washed into it for 60 or 70 years carried to the Soonderbunds or Sandheads, surely the Lake itself including the present navigation through it, must have been greatly filled up.

Minute by D.
McFarlan, Esq.

The high character of Officers who have sat on this Committee, renders me apprehensive

*A.—Memorandum of the Volume of Water discharged by the Calcutta Drains at their highest water-mark into the Salt Water Lake, between the Chilpore Nullah and the Durrumtollah Drain.

	ft.	in.
Drains at Kuntapookur,	21	0
„ „ Baug Bazar,	6	0
„ „ Shaum Bazar,	8	0
„ „ Bulram Ghose's Street,	27	0
„ „ Oaltadangh,	15	0
„ „ Nundun Baugau,	6	0
„ „ Shaumpooker,	24	0
„ „ Hoogulkooreah,	15	0
„ „ Kistno Baugau,	12	0
„ „ Mussulmanparrah,	8	0
„ „ Maunicktolla,	42	0
„ „ Opposite Raimmohun Roy's Garden,	11	0
„ „ Sukeas' Street,	15	0
„ „ North of Hurry Ghose's Street,	15	0
„ „ Hurry Ghose's Street at Mutchua Bazar,†	55	0
„ „ Colootollah Tunnel,	80	0
„ „ South of Ditto,	10	0
„ „ Boitacannah,	32	9
„ „ Durrumtollah,	36	0
Total cubic feet, ..	391	9

E. E.

(Sd.) A. H. BLECHYNDEN,

Superintendent.

CALCUTTA :

February 20th, 1832.

† This would require apparently the construction of a Canal 30 feet wide at top, 10 at bottom, and 10 deep, to above 200 feet section.

that the opinions I entertain on their proposition to get rid of this deposit in the Canal, by Draining the northern parts of the Town by a Cut south of the Intallee Canal, must be erroneous, as however there appears to me to be not the slightest chance of the proposition being ever brought forward as a feasible one, by any practical man. I will not enter upon the Committee's recommendation more fully now. I will only append for future reference, a memorandum marked A,* of the volume of water, for which one great Drain is proposed to be provided, and state (for the same purpose) that the fall available from the Town to the Lake is so small that many of the Drains have actually exceeded their allowance of fall before they reach the Circular Road, and when after the rains the water in them has become low it must be bailed up to

a higher level, in order to take a new start to reach the Lake.

Perhaps we may defer sending up the Report till we shall have received any remarks which Colonel Tickell may offer upon it. When we do send it up, however, we should notice generally that the Committee was convened with the view of placing on record the manner in which a very important public work had been executed, and that although the report has disappointed us, we deem it proper to submit it to Government.

For the reasons above assigned, however, we should before sending up the Report call upon the Superintendent,—1st for an explanation of the data, (measurement or otherwise) on which he has estimated the amount of deposit, noting distinctly the grounds on which the whole or the greater portion of it may be ascribed to the effects of one year's rain.

2nd. We should call for from him and the Superintendent of Suspension Bridges for a joint Report on the causes that may have led to the cracks in the Piers of the Boitakhana Bridge; because if it should turn out that the foundations themselves have inclined to the Canal, there will perhaps be just reason to infer that the same cracks might again occur in the new Piers, and because perhaps the present Piers may stand sufficiently secure if the fulcrum or point of suspension were removed a little back from the present point. They should also Report whether another Bridge, I think the Manicktolla one, is not apprehended to be defective in consequence of the Piers having inclined forwards.

3rd. I think a copy of the Report should be furnished to the Superintendent. There is in it a Statement (paragraph 6) which required explanation. The Roads are constructed on the same principles as the best Roads in Calcutta, and ought to be much better than those in the vicinity, which are of earth—only one-fourth the measure recommended in paragraph 5th, should be authorized.

(Signed) D. McF.

Minute by Lieutenant Colonel Galloway.

[Canals.]

23rd March, 1832.

The numerous schemes and conflicting opinions presented to the Board by professional men of high reputation on the further progress of the Circular Canal, render it necessary in my estimation that we proceed with great caution. I have before me an Estimate by Mr. James Prinsep, of the expence of making the Lock passage of that Canal, amounting to Rupees 98,912. Besides which, there is the whole of the valuable ground near Chitpore to be purchased, the cost of which will be perhaps as much more, and I have also before me a Report by a Special Committee of able Engineers,* in which it is reported, that a sum of 15,000 Rupees will be required annually to keep open this Canal, and that moreover, it will after all be impracticable to keep it permanently open, notwithstanding those Lock passages, unless a passage for the water of the Calcutta Drains shall be made in another direction, that is, unless another Canal shall be formed to carry off what will choak up this one.

* Col. T. Wood, Engineers.
Major Irvine, ditto.
Capt. Forbes, ditto.

† Report dated —
received 23rd January, 1831.

"Although at variance," say this Committee,† "with the possibility of keeping the navigation permanently open, we recommend, &c. that the plan suggested by Mr. Prinsep of digging out the soil after the rains, may be had recourse to. The effect of the Lockage water admitted by these Locks, will doubtless be to disperse more uniformly over the bottom of the Canal the soil now accumulated in nearly impassable shoals at the entrances of the Drains."

This is what the Locks would do. What would be the effect were there no Locks but "a free admission of the water of the Hoogly? The effect of the free admission of the water of the Hoogly would probably be to move these shoals (in less inconvenient forms) into the Balliaghaut Canal, or that portion of the line of Canals joining the Circular Canal,‡ and the branch crossing the Salt Water Lake."—*Report Colonel Wood's Special Committee.*

‡ That is the Entalle Canal.

Thus has the Canal cut off the line of Drainage of Calcutta: that Drainage must therefore be admitted into it; or, as this Committee propose, a new line of Drainage must be formed. But to admit that Drainage is to destroy the Canal for navigation. Therefore an annual expence of 15,000 Rupees must at all events be immediately incurred, to clear out the soil deposited, and this noisome soil must of course be thrown out in the immediate vicinity of the City where it will lie to the detriment of the salubrity of the place.

§ Letter 7th February, 1832.

Lieutenant Colonel Tickell§ concurs with the Special Committee in the above view. "I lately," he says, "examined the works on the Circular Canal, accompanied by Mr. Prinsep, and fear that it will be impossible, except at an enormous expence, to keep open the navigation, if the dirty Drains be allowed to empty themselves into it as at present."

Against these opinions we have those of the Chief Engineer, (in which the other Members of the Board, excepting myself, appear to concur) who says, that "when the Locks are completed every advantage to the complete navigation of the Canal may be expected," &c. "the free communication of a current from the Hooghly and *vice versa* through the Canal from the Lake one way or even both, may dissipate the silt or filth from the Drains, and whatever other matter may be collected in the Channel of the Canal."

It might perhaps be sufficient for me to let the question rest on the conflicting opinions borne down, as those on one side are by the immense expence in certain prospect for completing and clearing out this Canal. My own opinion of the impossibility of keeping this Canal free from the deposit of the Calcutta Drains, was expressed in a Minute so long ago as the 13th July last.|| Mr. Prinsep had stated "that the scheme proposed for the Circular Canal, never contemplated leaving open the communication with the River during the rainy

ed No. 96, of this Appendix, page lxii.

“season: indeed that it had been deprecated from the beginning, even if no inconvenience were likely to accrue to the Drainage—such damage would inevitably ensue to the Banks and bed of the Canal, from the velocity and turbidity of the River water, as would soon completely destroy the main object of the Canal, permanence of Section and depth.” I quote from Mr. Prinsep’s Letter 5th June 1831, and with reference to this I observed,—“We ought further to consider, since it now appears that only a very diminished strength of current can be admitted from the River, how we are prepared to keep the Canal open from the immense deposit brought into it, not only by the turbid water of the River, but especially by the Calcutta Drains. Further, but supposing we can throw into it a current sufficient to keep it at a navigable depth, whilst it is confined within its own regular Channel and section, how are we prepared to prevent the matter from settling, when this force of current is lost by entering into the extended surface of the Lake? This appears a dilemma. We must have a strong current to prevent the Canal from being choked up, but if we admit a strong current, we destroy the Canal: and thus both with and without a current it must be destroyed.”—I adhere to these sentiments.

The opinion of the Special Committee confirms all this. It would indeed be taking up the time of the Board profitlessly to enter into any argument to prove that a large body of soil brought into a Canal must impede and ultimately stop navigation in it, that no current can be introduced into such Canal sufficient to remove such deposit which will not also occasion a corrosion of its Banks, and “destroy its permanency of section;” and moreover, if such an effect did not take place, it is obvious as demonstration itself, that such a current can only be maintained whilst the water remains confined within the regular section, consequently could a current be introduced and thus kept up so far, the moment that section is extended the current will be diminished, and in this case, as the Canal opens into a wide, shallow, and extended Lake, so the current losing the force, which, when confined, enabled it to bear along the soil suspended in it, must deposit that soil in the shape of a shoal at its entrance into the Lake.

See Mr. Prinsep’s Letter above quoted.

I would ask those who propose a Lock of 24 feet width, to admit water into a Canal which I believe is now 90 feet broad; and with a current would soon become much more—I would ask them, what velocity of entrance they would give this water, so as to keep up sufficient force of current throughout, to clear the Canal and to carry off these shoals when the section of 90 feet has expanded to 900 feet in the Lake? and I would remind them, that in working Locks it is but the feeding and emptying sluices, by which water is admitted into the lower branch of a Canal. These, by the plan, have an opening of 3×2 equal to six superficial feet; but if the sluices admitted water at the course of 10 miles an hour, they would not furnish so much as would give *even motion* to the Canal, instead of scouring it of soil and shoals. What then is to be done? To open the Locks entirely? This cannot be done in the rains, the time when those shoals are formed, during that period accumulation must have taken place: it will then remain to be seen what is to move that accumulation.

No doubt a Lock passage firmly founded and substantially built, with the Banks of the Canal raised sufficiently, as Mr. Prinsep suggests, would protect the Town from danger and from inundation, *except by the Drains*, and no doubt also a passage might be formed on a scale small and sinuous enough to be safely opened into the River without any Lock, as the Marhatta Ditch at Chitpore demonstrates. But before we can argue, that because such an opening as that of the Marhatta Ditch at Chitpore exists with safety, contracted throughout and winding by a lengthened devious course, that so also the straight and wide Circular Canal, leading from the River by an easy and short line into the expanded basin of the Salt Lake, 12 feet lower than that River, may also safely exist: we must be prepared to maintain that all forces are equal, all quantities equivalent; and that extent of cause produces no magnitude of effect.

The flimsy nature of the Lock passage proposed by the late Capt. Prinsep, submitted as that which had originally obtained the sanction of Government, weighed much with me. By the plan now submitted, that has been greatly reinforced and strengthened; the Central Pier, which was only 8 feet thick, is now 26, and the foundations are carried down 10 feet instead of two: the whole of the works being also piled in front and in rear. If the Canal is to be opened, no expence, no pains ought to be spared to fortify the works of the Lock. In this part of the discussion I join the Chief Engineer; who justly calls the most serious attention to the examination of the soil under the foundations of the Locks, as well as to the foundations themselves; and no less justly deprecates the notion of a piece-meal passage into this Canal, by first making one opening, and then, if required, another abreast of it, to the certain injury of the former. I am not a little surprised indeed that such a measure should have been seriously proposed. I am no less surprised at the proposition for widening the Chamber of the passage from 24 to 30 or 32 feet, to admit steamers to the benefit of the Canal; but as the Chief Magistrate informs us that that scheme is now abandoned, no further remarks appear necessary.

But I must observe, that so great has been the vacillancy which has prevailed in the plans and schemes propounded for the execution of this work, that I have but little confidence in the projects of those who have shown so little in their own: one thing I wish to see, since Government have resolved that an opening shall be made into the Hoogly; and that is, that the entrance to that opening be formed by work of the most permanent and durable description. I will most cordially promote every thing that tends to strengthen this part of the work.

One Lock of 24 feet now seems to be the favourite scheme, because it is cheap; but this appears to be adopted without any investigation. It is taking, as is supposed, half the original plan at half the original price. But this either reduces the opening of the Canal into the River to half its original utility, or it assumes that the projector of a double passage advised an unnecessary expence. It is at all events a complete change of design, and one that might involve consequences which do not appear to me to be foreseen. In order to show this, if this Canal were of that substantial and permanent nature (and unconnected with danger to the Drainage of Calcutta by obstructing the Drains) that a current might be admitted into it from the River, sufficient to scour it and keep it free from the deposit left by those Drains, without destroying its section, it is obvious that one opening of 24 feet wide might not be able to maintain that current, though two such openings might. Here then the Board will perceive that the reduction of the Lock passage to one of 24 feet instead of two such, is not a simple question. I state this to show the danger of thus adopting mere suggestions without investigating their bearings; but not that I am of opinion the double Lock would answer the purpose intended of keeping this Canal permanently navigable. The whole works, Bridges, &c. on this Canal, have been constructed without the slightest provision for this inevitable contingency from the Drains, but which is itself so obvious, that it ought to have been foreseen and guarded against.

The correspondence and reports should, in my opinion, be immediately laid before Government, in order that they may be made acquainted with the difficulties which now have developed themselves. They should know that heavy expences unlooked for, and of a permanent description, have arisen; that instead of this Canal becoming a source of profitable income, it will become more and more a source of heavy outlay.

Another point I consider of the utmost importance to be brought to the notice of Government, and which throughout the voluminous discussions on this Canal I nowhere perceive to have been thought of, it is this:—We have seen that in the rains the River rises 12 feet above the level of the Salt Lake. But it is known, that for the rest of the year, that is, for about eight months, the level of the River is considerably lower than that of the Lake. The extreme low-water mark of the Hoogly in the dry season is $8\frac{1}{2}$ feet lower than

the surface of the Lake. In neap-tides in February, for instance, the whole rise of the tide is but 8 feet,* so that at that season the current will always set from the Lake into the River.

* See the annexed Table.

The water in the Salt Lake is within a few degrees of being as salt as that at Saugor. That Lake, and the Canal, are the common Cesspools of this immense City : consequently, the quantum of salt water, and impurities of the most offensive description, brought into the River by an ebb of so long duration (at certain seasons constant), must be very great. The poorer inhabitants of Calcutta are obliged to have recourse to the River for their water. That water will then be a brackish mixture, contaminated with the filth of the Calcutta Drains, for, coming into the River on the same side, and just above the Town, the water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream ; and thus keep its position in shore, where alone water is accessible to the inhabitants, and to the crowded population afloat in Boats along the side of the River.

With reference to this important consideration, as it affects the comfort of the inhabitants of Calcutta, as well as to the Drainage of the Town in the season of the rains, I beg to insert the following Table, showing how, in the rains, the Drains of Calcutta are liable to be obstructed by the Canal, should a heavy flow of water enter it ; and how, in the dry season, the water in the River is liable to contamination, both from the salt water of the Lake and the filth of the Drains washed into the River by such salt water.

I am indebted to Mr. Kyd for the materials from which the above Table is compiled. The Levels of the Drains are taken from Mr. James Prinsep's Report thereon. The Level of the Lake no doubt varies a little with reference to the River, but probably not above a foot or two in the dry weather ; and in the rains, we know from Capt. Schalch's printed Memoir, that the River rises upwards of 12 feet above the surface of the Lake. Here it is 12 feet 4 inches.

It is manifest from the above Table, that whenever the River shall be admitted into the Canal so as to raise the water in the Canal but $1\frac{1}{2}$ feet above the Level of the Lake, that then will commence obstruction to the Narkooldanga Drain, and so to the other Drains according to their Levels. It is manifest equally that in the freshes of the rains, the bottom of that Drain will be 11 feet under the surface of the River, and that all the Drains will be submerged all of them several feet. Thus it is demonstrated, that the water of the River cannot be admitted into the Canal without limitation, whether that limitation shall be effected by a constricted entrance passage or by Locks formed so as to regulate this without being entirely opened, a measure which does not as yet appear to have been thought of.

Again, with respect to the admission of salt water from the Lake in the dry season, I may be told that, to prevent the pollution of the River the Locks may be shut, no doubt they may, but then how shall vessels freely pass, as Government has hitherto been led to conclude, at all times but during the freshes ? All this diminishes the utility of the scheme so as to present its value in a very different light from that in which that Canal has hitherto been presented to Government, whilst its cost and expences of keeping it clear are greatly increased.

Mr. Prinsep states, the time required to fill the Chamber of the Lock to be $2\frac{1}{2}$ minutes on the average difference of Level assumed at 8 feet : to empty it will require as much : to admit a Boat and to let it out, may, I suppose, be taken at 10 minutes more, and for the manœuvring of the Gates 10 minutes more : in all 25 minutes for passing a Boat or 4 Boats per hour, or 48 per day. But with a Draw-Bridge as proposed, this would block up the Barrackpore Road entirely, therefore, should the passage be opened, a Suspension Bridge is indispensable.

On the whole therefore, whether with reference to the additional expence required for completing the improved plan of the Lock passage, or to the cost requisite annually for

clearing out the shoals formed from the Calcutta Drains, or with reference to the opinion expressed by the Special Committee of Engineer Officers as to the ultimate impracticability of keeping open the navigation of this Canal, or to the objections of a different nature above adverted to by me, I am of opinion, that before any sum shall be further authorized to be expended in prosecuting a work obnoxious to so many objections, and at the most holding out so few advantages, the documents before the Board should be laid before Government, and that this should immediately be done.

I have omitted to notice the farther scheme proposed for remedying the obstruction of the navigation of the Canal from the soil brought into it by the Calcutta Drains, namely, to form Dams or Weirs as they are called, at the mouth of each Drain, where the current of the Drain being intercepted by a higher Level may deposit the soil before the water reach the Canal. But where are these Dams to be formed? where is the room? and if there be, it must be obvious to us all, that no such Dam can be formed that will not raise the bed of the Drain exactly so much as the Dam is raised, and consequently so far obstruct that Drain. Can the Calcutta Drains afford to lose any portion of their slope? I believe not. I believe that on the contrary, their fall of Level is so small as hardly to give any current without rain.

(Sd.) G. A.

No. 103.

No. 4902.

TO THE VICE-PRESIDENT IN COUNCIL.

HON'BLE SIR,

12th April, 1832.

We have the honor to submit for the consideration of your Honor in Council the

Territorial Department.

* Letter from Mr. J. Prinsep, No. 379, of 17th December 1831.

Letter from Lieut. Col. Tickell, No. 2160, of 29th February, and enclosures Report of Col. Wood's Committee of 23rd January.

correspondence noted in the margin,* relative to a modification in the Locks originally planned for the Circular Canal by Captain Thos. Prinsep, and sanctioned by Government on the 6th January 1829, and

to the great inconvenience resulting from the mud deposited in the Circular Canal by the Calcutta Drains.

2. Captain T. Prinsep's estimate for Locks amounted to Rupees 60,000. Mr. James Prinsep's revised estimate amounts to Rs. 98,912. The causes of the difference are satisfactorily explained in Mr. Prinsep's Letter of the 17th December, and consist in giving a greater depth to the foundation: an increased scantling to the superstructure: an additional pair of small Gates, and a different arrangement of the Draw-Bridges.

3. The majority of the Board approve of all these changes except with respect to the Bridges, for which they think it will be much more convenient to substitute Suspension Bridges, as suggested in the 9th paragraph of Mr. Prinsep's letter.

4. With respect to the proposition contained in the 15th paragraph of Mr. Prinsep's letter, of the 11th February, to substitute one Lock of 30 or 32 feet wide, capable of admitting Steamers, which is approved by Lieut.-Col. Tickell in his letter of the 29th February, we think there are insuperable objections to the attainment of the proposed benefit. In the first place their funnels would probably be found too lofty to permit them to pass under the Bridges. 2ndly, Their passage would dangerously interfere with every other description of Craft in the Canal. 3rdly, There would not ordinarily be depth of water enough in the Entally Canal for Steamers to pass through into the Sunderbunds. 4thly, Gates of great breadth are much more unmanageable than those of a smaller size.

5. Mr. Prinsep himself has acquiesced in the validity of these objections, but is satisfied that he can overcome the difficulties which might be apprehended in the event of a second Lock being required to be added, and in building the first will make suitable adaptations for such an occurrence.

6. There are other reasons which induce the majority of the Board to recommend one Lock instead of two, viz. 1st, The want of data to lead them certainly to expect that the ordinary amount of traffic through the Locks will require two Locks instead of one. If one will suffice, it follows that expenditure upon the 2nd would be thrown away, and 2ndly, Because from the argument detailed in Mr. Prinsep's letter to Colonel Tickell of the 5th June last, from the parallel cases of the Marhatta Ditch, the Bhowanypoor Ditch, (communicating with the Drains near Short's Bazar,) and Tolly's Nulla itself, it is not clear whether a Lock may not be found to be unnecessary, and 3rdly, Because one Lock will apparently give a current in the Canal sufficient to aid in cleansing the bottom from the deposit from the Drains.

7. The majority of the Board have therefore given instructions for the immediate commencement of one Lock of 24 feet wide, the expence of which may be estimated at about Rs. 50,000.

8. With respect to the vast quantity of mud estimated by Colonel Wood's Committee, to have been deposited last year in the Circular Canal, viz. 883,000 cubic feet, the majority of the Board are of opinion, that even assuming the above quantity to be undeniably correct, yet that it cannot be taken as indicating the quantity that will be deposited in future years, because the Bank of the Canal will naturally have been more worn in yearly, than it will be in future years; and because, as the Chief Magistrate has informed the Board, the sides and bottoms of the Drains, between the Circular Road and the Canal, were greatly corroded by the rapidity of the Drainage, and they think on the other hand, that the Committee have underrated the force of the alternate current from the Salt Lake into the River, and from the River into the Salt Lake, in scouring the Canals, and thereby preventing and carrying off deposit. It is calculated, that if one-half of the above great deposit were swept away by the current, the remainder being equally spread over the bottom of the Canal would fill it to a depth of a little more than 3 inches annually. We do not pretend to say that the extent of this inconvenience can be accurately calculated beforehand, but we are disposed to think it has been overrated by the Committee, and it does not form, in the judgment of the majority of the Board, a sufficient reason for declining to complete the Canal, nor for constructing another Canal parallel to the West and South banks of the Circular and Entally Canals, for the purpose of carrying the contents of the Drains into the Salt Lake.

9. Lieut.-Col. Galloway concurs with the Special Committee, of which Colonel Wood was President, and with the Superintending Engineer in the view they have taken as to the impracticability of keeping open this Canal except at an enormous expence. He has entered into that question and other points connected with this work in detail in his accompanying Minute,* which is herewith submitted for the consideration of your Honor in Council.

10. We have to request, that the Original Documents when no longer required be returned to this Office.

(Signed) THOS. ANBURY, *Colonel, Chief Engineer.*
 „ A. GALLOWAY, *Lieut.-Col., Member Military Board.*
 „ D. McFARLAN, *Chief Magistrate and Officiating M. M. B.*
 „ JOHN CRAIGIE, *Lieut.-Col., Member Military Board.*

* See Paper marked No. 102, of this Appendix.

No. 104.

No. 4903.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board to acknowledge the receipt of your Letter, No. 2460, of the 29th ultimo, and to observe, that several objections present themselves to the adoption of the plan recommended in the 2nd paragraph of your Letter, namely : The substitution of one Lock of 30 or 32 feet in breadth for the purpose of admitting Steamers.

2. In the first place : Their funnels would probably be found, too lofty to permit them to pass under the Bridges. Secondly : Their passage would dangerously interfere with every other description of Craft in the Canal. Thirdly : There would not ordinarily be depth of water enough in the Entally Canal for Steamers to pass through into the Sunderbunds. And Fourthly : Gates of great breadth become greatly more unmanageable than those of a smaller size.

3. In a conference with the Chief Magistrate, Mr. Prinsep has admitted these objections to be conclusive.

4. He has further stated that upon a full consideration, of all the circumstances of the case, it appears to him most advisable to construct one Lock of 24 feet wide ; and though difficulties might be apprehended in the event of a second Lock being required to be built adjoining or adjacent to the first, Mr. Prinsep is satisfied that they may be surmounted, and in building the first will take measures accordingly

5. The Board concurring in these views, you will therefore request Mr. Prinsep to commence on the execution of this work without delay.

6. You will also give instructions for making the alterations recommended by Colonel Wood's Committee, to the Boitacanna Bridge.

7. With reference to the 9th para. of Mr. Prinsep's Letter of the 17th December, you will request him to submit an Estimate for a Suspension Bridge to be substituted for Draw-Bridges.

16th April, [1832.]

No. 105.

No. 839.

TO COL. SIR THOMAS ANBURY, K.C.B.,
LIEUT.-COL. A. GALLOWAY,
D. McFARLAN, ESQ., AND
LIEUT.-COL. JOHN CRAIGIE,

Members of the Military Board.

Miscellaneous Revenue.

GENTLEMEN,

Your letter No. 4902, dated the 12th April last, with its enclosures, having been forwarded to the Right Honorable the Governor General, I am directed by the Vice-President in Council to transmit for your information, the accompanying copy of a Letter* received from His Lordship's Secretary in reply, and to intimate that His Honor in Council sanctions the construction of the Lock for the Circular Canal, with a single Chamber, at an expence not exceeding (Rs. 50,000) Fifty Thousand.

2. The original correspondence, which accompanied your Letter, is herewith returned : copies having been kept for record.

I have the honor to be, Gentlemen,

Your most obedient Servant,

J. THOMASON,

Deputy Secretary to the Government.

FORT WILLIAM :

The 3rd July, 1832.

* See Appendix
I. page 33.

No. 106.

No. 1119.

FROM THE SECRETARY TO THE MILITARY BOARD.
TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board to inform you, that Government have on the 3rd instant, authorized the construction of the Lock for the Circular Canal, with a single Chamber, at an expence not exceeding 50,000 Rs.

The mode of removing soil deposited in the Canal, by bunding and hand labour, has also been approved, and should be resorted to as soon after the close of the rains as the fall of the River will admit, by constructing a temporary Bund across the Canal immediately beyond the shoals, and then drawing off the Stream of the Canal as far as possible by opening the Gates of the Lock at low-water, and employing strong working parties, so as to give as little interruption to the navigation as possible.

10th July, 1832.

(Nos. 107 to 121 inclusive, omitted.)

No. 121. a.

Extract—Annual Report on Canal Operations during the year 1831-32.

2. The state of the whole line of Canals is much the same as it was last year, nor do any of the Cuts appear to have suffered as yet materially from the process of gradual deposit of silt; the spots which were before pointed out, as presenting shoals in the several cross Canals, are perhaps a few inches more shallow and are impassable at low-water; but at high tide, Boats of considerable draught still pass without difficulty—and the Report of Boats which I have kept up to the end of May last shows an average of Five Thousand per month, agreeing with that noticed in the Table I had the honor to furnish with my Report of the 31st December, 1831.

Mofussil Canal.

3. I have therefore nothing immediate to recommend connected with the Mofussil Canals for the ensuing season.

12. The deposit of soil from the Dhurmtulla Drain at the head of the Entallee Canal was accurately measured at the close of the rainy season, by sounding in three points of a Section of the Canal at 50 feet. The total, as will be seen by the abstract of these soundings in Appendix E, is 94,250 cubic feet, nearly agreeing with the Estimate made in my Letter of the 10th March, 1831, from the combined effect of six years' deposit, since the former cleaning of this Canal by my predecessor.

Deposit from 1825,
to 1831—6)607,833
cubic feet. 100,000
per annum.

13. I am sorry to say that the Canal to the East of the Koolya Bridge, is now rapidly filling up. In the course of a year or two, it will require to be emptied and excavated in gradual portions all the way to the Lake, if it is intended to preserve the navigation unimpeded; the mouth of the Canal towards the Lake is also becoming more and more choaked with sediment since the Dredging Boats have ceased to work in that quarter, but when the opening of the communication with the River through the Lock-Gates shall have shown how far it is possible to clear the line of Canal by hand-digging, it will be time enough to determine what steps shall be taken to remedy the defects of the present Channel.

22. The Dum-Dum Tunnel Drain was made in the same plan as those of Nurkuldanga and Manicktollah, to carry off the water from the Bagh Bazar Division of the Town, formerly

Drains.

drained by the Marhatta Ditch, as the main portion of this Drainage travels to the more central Drain at Ooltadanga, and as a Bridge exists near the Thannah connecting the Drains of the two sides of the Road, I did not think it necessary to construct more than one Drain to this Bridge, some alteration was made in the plan of the front towards the Canal, introducing steps on the side walls, which have a better effect than the bluff terminations of the other Drains.

23. Twenty-one cross Drains of greater or lesser size, were found requisite along the line of Pucka Road from Manicktollah to Dum-Dum Bridge.

24. The average charge for them is Rupees 180, or per 100 cubic feet of masonry 13 Rupees 13 annas. They are mostly provided with iron gratings in the gutters on the sides of Road to prevent large stones, &c. from falling in.

29. As recommended in my last Report, the experiment of lessening the slope of one of the City Drains with a view to diminish the quantity of silt brought with the drainage water into the Canal, was tried upon the Northern Drain of the Bythukkhana Road, the deposit does seem to have been lessened thereby, and the bed of the Drain is evidently raised throughout its whole extent, but as this Drain is of minor importance compared to the great Drains of the Nurkuldanga Division, the experiment affords hardly a fair criterion of the effect of such a measure upon them. I hesitated to make the trial at once upon them from a fear that it would inconvenience the Drainage.

30. The table of measurement in Appendix F. exhibits the state of the Canal in front of each of the principal Drains, after the last rainy season. It will be remarked that although the two Dredgers were kept constantly at work ultimately at Ooltadanga, Manicktollah and Narkuldanga, still they could not altogether keep pace with the deposit. Estimating the quantity of mud lifted by each Boat during the season at cubic feet 600 per diem, it appears that the annual deposit at each place in 1832 is nearly as follows—

			Mud taken up by Boats.	Remaining deposit measured.	Total Deposit.
Manicktollah,	..	..	72,000 feet.	37,625 cb. feet.	109,625 feet.
Narkuldanga,	..	..	144,000 feet.	68,333 cb. feet.	212,333 feet.
Bythukkhana,	..	..	..	39,000 cb. feet.	.. ..

being smaller than my former estimate in the ratio, of (say) five to six. I can have nothing to add to my former remarks upon this subject until the opening into the River at Chitpore shall have shown what can be effected by hand-digging towards the removal of the annual deposit.

Chitpore Lock-
Gate.

31. The plan finally approved of, by the Board for the Locks at Chitpore comprehended a single system of Gates on the scale provided by the late Superintendent, with the addition only of a second Canal Gate behind the outer River Gate intended to form a Chamber for the passage of Boats out of the Canal, when the water of the River should be lower than that of the Canal. Upon the receipt of the orders of the Board on 2nd July, I lost no time in digging and laying in the foundations upon this plan, and had the honor to Report their completion in my letter to yourself, dated 20th July, 1832.

The substratum of clay was of a firm nature and extended to the depth of 40 feet below, the foundations as ascertained by boring; at the same time the spread of the foundations was so great, that I did not anticipate any material subsidence. Upon completion of the masonry, however, it was ascertained that the whole mass had settled nearly one inch without affecting the level of any part excepting the detached stairs at the extremities of the wing walls where the steps lost their level to the above extent. The floor of the Lock also not having an equal pressure upon it, did not sink to the same degree, notwithstanding the inverted arch intended to connect it firmly with the side walls: a small crack consequently opened along the central line of the floor, but it was merely superficial, and was easily filled in with fine mortar. The level of the sill-stones was barely affected and by no means to such extent as to need any adjustment.

41. Connected with the Road on the South of the Chitpore, I should also mention that a large Drain will be necessary to clear the Mohulla of Soor Bazar, formerly drained into the Marhatta Ditch. This work may be on the same scale as that on the opposite side of the Canal, and will consequently contain 4,000 feet of masonry and cost about 700 Rupees.

42. I have also lately forwarded to the Military Board a plan and estimate for walling and tunnelling the Western portion of the Marhatta Ditch, up to the old Bridge, as it will pass under the new Road, leading to the Lock Bridge. The estimate for this work was 2,315 Rupees, 4 annas.

43. Accurate plans have been made by Surveyor Turner of the ground purchases available on each side of the Canal, divided into suitable portions, numbered, and the measurement of each calculated, and entered in Tables furnished to the Aumeen of Canal purchases in the Office of Mr. MacFarlan.

No. 121. a.⁽⁵⁾

APPENDIX E.

Statement of Mud deposited in the Entalee Canal from Durmtula Drain to Koolya Bridge in 1832.

Length.		Breadth.	Depth of deposit.	Cubic feet.	REMARKS.
Ft. in.		Ft. in.	Ft. in.	Ft. in.	
Durmtula Drain					
	50 0	30 0	3 0	4,500 0	
to	100 0	30 0	4 0	6,000 0	
to	150 0	30 0	4 9	7,125 0	
to	200 0	30 0	4 2	6,250 0	
to	250 0	30 0	4 8	7,000 0	
to	300 0	30 0	4 6	6,750 0	
to	350 0	30 0	3 2	4,750 0	
to	400 0	30 0	3 5	5,125 0	
to	450 0	30 0	3 5	5,125 0	
to	500 0	30 0	2 4	3,500 0	
to	550 0	30 0	2 0	3,000 0	
to	600 0	30 0	1 8	2,500 0	
to	650 0	30 0	1 1	1,625 0	
to	700 0	30 0	1 0	1,500 0	
From 750 to 1,750, ..	1,000 0	30 0	0 6	15,000 0	
From 1,750 to 3,150, }	1,450 0	30 0	0 4	14,500 0	
Total, ..	3,150 0		Cubic feet,	94,250 0	

No. 121. a.^(b)

APPENDIX F

Table of Deposit Mud in the new Canal between Bythukkhana and Manicktola.

BYTHUKKHANA.

	Depth of Bed of Canal below revetment		Depth of deposit in 1832.	Length.	Breadth.	Cubic feet.	REMARKS.
	In M-y, 1832.	In October, 1832.					
150	9 9	10 4	.. .	50 0	80 0		
100	10 0	8 10	1 2	. ..		1,666 8	
50	9 3	8 4	0 11	. . .	.	3,666 8	
..	10 8	7 10	2 4	. ..	. ..	9,333 4	
..	9 7						
50	9 9	8 4	1 5	.. ..	. .	5,666 8	
100	9 9	8 4	1 5	.. .	.	5,666 8	
150	9 7	8 4	1 3	. ..	. .	5,000 0	
200	9 7	8 4	1 3	. . .	.	5,000 0	
250	9 7	9 7	.. ..	. ..	. .	. ..
Total cubic feet,						39,000 0	

There is some uncertainty about the soundings in this measurement.

J. PRINSEP,

Superintendent Canals.

No. 121. a.^(G)—(Continued.)

NURKULDANGA.

	Depth of Bed of Canal below revetment.		Depth of deposit in 1832	Length.	Breadth.	Cubic feet.	REMARKS
	In May, 1832.	In October, 1832					
300	8 7	8 3	0 4	50 0	80 0	1,333 4	
250	8 2	8 1	0 1	.. ..	.. ..	333 4	
200	7 11	6 10	1 1	. ..	..	4,333 4	
150	9 7	6 11	0 10	. ..	. .	3,333 4	
100	6 11	6 5	0 6	. ..	.. .	2,000 0	
50	7 1	6 11	0 2	.. ..	.. .	666 8	
	6 10	5 7	1 3	. ..	.. ..	5,000 0	
50	6 11	5 3	1 8	. ..	.. ..	6,666 8	
100	6 5	4 7	1 10	.. ..	.. ..	7,333 4	
150	5 9	4 7	1 2	.. ..	.. ..	4,666 8	
200	6 5	4 4	2 1	.. ..	.. ..	8,333 4	
250	6 5	4 8	1 9	.. ..	.. ..	7,000 0	
300	7 6	4 8	2 10	.. ..	.. ..	11,333 4	
350	7 2	6 1	1 1	.. ..	.. ..	4,333 4	
400	6 10	6 5	0 5	. ..	.. ..	1,666 8	
450	6 11	7 3	.. ..	.. ..	.. ..	.. ..
Total cubic feet, ..						68,333 4	

Besides about 240 days' work of one dredger taking up on an average 600 cubic feet per diem = 144,000 cubic feet.

J, PRINSEP,
Superintendent Canals.

No. 121. a.⁽⁶⁾—(Continued.)

MANICKTOLA

	Depth of Bed of Canal below revetment.		Depth of deposit in 1832.	Length	Breadth	Cubic feet	REMARKS
	In May. 1832.	In October, 1832					
150	10 9	9 10	0 11	50 0	70 0	3,208 6	
100	10 11	7 6	3 5	.. .	.. .	11,958 6	
50	8 9	6 4	2 5	. ..	. ..	8,458 6	
..	9 11	8 7	1 4	.. .	. .	4,666 0	
50	7 3	8 0	0 9	.. .	. .	2,625 0	
100	7 7	8 0	0 5	.. .	. .	1,458 6	
150	10 0	8 10	1 2	.. .	. .	4,083 4	
200	9 9	9 5	0 4	. .	. .	1,166 8	
Total cubic feet,						37,625 8	

Besides about 120 days' work of one dredger taking up 600 cubic feet per diem = 72,000 cubic feet.

CALCUTTA,
SUPT. CANAL OFFICE:
The 31st December, 1832.

J. PRINSEP,
Superintendent Canals.

(No. 122 to No. 126, inclusive omitted.)

No. 127.

FROM CAPTAIN F. JENKINS,

On Special Survey.

To CAPTAIN G. YOUNG,

Secretary Military Board

Calcutta, 29th June, 1833.

SIR,

I have the honor to acknowledge your letter No. 904, of the 25th instant, calling upon me to submit to the Board such observations as I made on the state of the Eastern Canals on my late passage through them.

2. That the Board may be able to form the better judgment on the observations and suggestions I shall have the honor to offer on the state of the Canals, and measures for their improvement, I conceive it may not be unnecessary to premise a summary account of my progress through the Canals

3. I reached Bussunt Golah in a 600 maunds Dacca Pulwar, light, about 5 P. M. of the 25th, carrying with me the last of the flood, and reached the mouth of the Hosseinabad Canal a little after the commencement of the ebb: the stream was then running gently into the Canal, but towards the end of the ebb it set into it with considerable violence.

Finding, I could not proceed at night, I anchored and weighed next morning (26th) at daybreak. At the time of starting there was still a good flood in the Juboona, and I had to proceed* against the current in the Canal, but the current was very slack, and to the point B (of the Map), I got on tolerably well, there being more or less convenient tracking ground: from B to C there being no tracking ground, I had to proceed on my oars, and so also from C to D, but approaching towards the point D, I had the advantage of a slight set of the ebb into the Gobragong, but to get through the Gobragong into the next artificial Cut, I had to get over the ebb, which was already setting out so strong as to make the labour severe. I could not pull against it with oars, and from the depth of the mud poling was almost impracticable. Under ordinary circumstances the Boat would have stopped, for that ebb at the fork of the Gobra below D, not having accomplished $3\frac{1}{2}$ miles, but I exerted the crew and my servant and reached the artificial Cut with great difficulty. Here I found the tide still against me, the Embankment was overgrown with jungle nearly to the point F, and prevented my tracking: at this point there is a partial cultivation, and I had just commenced proceeding on the *goon* with a very slack current in my favor when my Boat, not drawing 2 *haths*, was stopped for want of water: this was about 9 $\frac{1}{2}$ A. M. At the end of the ebb we were left completely dry upon a hard sandy bottom that might have been fatal to a laden Boat. At half an hour after 12 I floated and reached G, on the *goon*, but there being no tracking ground further, I had to wait until near 4 P. M. for the flood to slacken. I then made way against the flood into Cheetpore Gong, and with the remains of that flood I ran up to and through the next artificial Cut, "proposed line" of the Map. I reached the Cheetpore Gong, I should remark, with difficulty, and if I had not succeeded I must have stopped at X, during the following ebb.

On reaching the end of the last mentioned artificial Cut, I found the tide still strong in the Chaytel, and had to wait for the ebb.

About 8 P. M. I dropped down to the Choomooch Gong, a large fine river, and there stopped for the next flood. The wind had been westerly all day but very light; had it been at all strong, I know not what my progress would have been, scarcely any thing however.

About 9 $\frac{1}{2}$ A. M. 27th, I started with the flood, reached Kooltee at 8, and carrying the last of the tide turned into Kooree Khal, whence my progress to Dhara was very slow, the tide before I reached the village having turned, and there being no tracking ground. At this village commences another artificial Cut, and here I met good tracking ground, and reached the point L against the ebb without difficulty, but between Morissa and L, I dragged the ground, and was nearly being stopped. The Canal runs dry at this point, and my detention would have been great had I not succeeded in clearing the spot.

From L, I dropped down to M, with the ebb, (I know not how the water of this Nullah makes off). From M, tracking through the artificial Cut N, with a very strong ebb, I left my Pulwar about 12 A. M. expecting delays in her, and got into a light fishing Canoe.

At O, I found two moderate-sized laden Boats aground on very hard *cunkur* ground. From O to P, I was carried down with a strong ebb, but at P, I met the ebb, and it ran with such strength that even my Canoe was unable to make way against it with oars, and the fishermen were obliged to track through the mud until near Bahmunghotta. From Bahmunghotta to Balliaghat I continued against the stream all the way, although the flood had set in before I reached Manickgunge, but it being then the dead of the neaps, the flood only swelled the waters, did not turn the current, at least not till I reached Balliaghat at 4 $\frac{1}{2}$ P. M.

My Pulwar reached Ballaghat that night, having been brought up from P, before a heavy Easterly gale, which commenced about 4 P. M *

4 To understand the value of the passage by the Canals for laden Boats, it is necessary to advert to what would have been my progress by the usual Sunderbund route under ordinary circumstances. On the turn of the tide on the evening of the 25th I should have dropped down without any detention and reached the Ragmungal [? Roymungal] with ease on that ebb. With the flood of the morning of the 26th I should have proceeded up the Ragmungal and stopped at half-flood at a place called Rampoorah, where a counter-flood is met. On the flood slackening there are two or three reaches to be got over against it (the ebb sets the same way as the flood here until very late) when the ebb is reached, this serves only for 2 or 3 reaches when the turn is against the ebb at the mouth of the Attara Banka, the ebb is slack and after 2 or 3 more reaches it is found to set into the Amjeeree and that point is generally to be gained in one ebb from the Ragmungal. Had I succeeded in doing this the morning's flood of the 27th would have taken me to Ballaghat, and had I not been successful in the difficult part of the navigation through the Attara Banka, I should have reached Calcutta, at any rate, at the same time as by the other route. From the Amjeeree up, the South-westerly wind then prevalent would have assisted progress, but in the Canals would not have been available, and it is to be recollected that I only brought a light Pulwar through the Canals in two days by great and continued exertion, and by the chance of not meeting a strongly westerly wind, and being latterly favored with an easterly gale

5 The objects in view in planning the Canals were I conceive, to shorten the passage for Boats in general, from the Juboona to Calcutta, and to avoid the difficulty and risk of dropping down to the Ragmungal and crossing it in the height of the South-westerly Monsoon but these have been imperfectly attained from the deficiency of the sections of the artificial Cuts and from the want of tracking grounds. In the old route heavily laden Boats can make way against even a strong wind aided by and dropping with the strong currents. In the Canals the currents generally are very weak except in such parts of the artificial Cuts as are immediately adjoining the deep natural Nullahs, and there only at the end of the floods is the set of the stream strong. The operation of dropping with a tide requires however a considerable width of river for it is analogous to the beating to windward of sailing Boats, and there is not a part of the Canals in which this mode of progressing could be available except for a short distance in the Choomooh Gong, from either want of width in the Nullahs or want of force in the current

The want of tracking grounds will therefore ever prevent the Canals from being used by large and laden Boats extensively. were Boats able to track the want of depth at certain points of the Canals would be of less consequence, as the Boatmen could rely on gutting over a certain extent of ground in a given time, against even moderately strong winds and counter-currents. Not having their *goons* to depend on they cannot calculate their progress, and must be subject to frequent unnecessary detentions, stopping in the natural Nullahs, afraid of venturing into the artificial Cuts lest they should be left dry and broken up

With the slightest air against a laden Boat of any size, progress with oars, except assisted by a stream, is quite impracticable, and with poles most laborious and most tedious, particularly where the mud is deep and retentive as is generally the case of these Canals.

6. The parts of the Canals in which it is most requisite to establish tracking grounds, are, firstly, that part from A, at the Juboona to X, at the Cheetpore Gong, a distance of about 7 miles: this must always be an extremely difficult part, but it would certainly be always got over during the last of the flood and first of the ebb with the command of a good track-

* The difficulties encountered by Capt Jenkins do not appear to have been generally suffered by other persons. — Was the time selected by Capt. Jenkins in passing the tide Channels the same as is usually selected by others? — J. M.

ing ground, the Embankments for the greater portion of this distance will afford a tracking ground at the mere cost of cutting down the small timber, which should never have been allowed to spring up. The other parts along the banks (on one side only) of the natural Nullahs will require a low causeway of 3 or 4 feet, and the expence will be somewhat heavy, but it appears to me unavoidable if the Canals are to be rendered of extensive utility. Secondly, from the commencement of the Kooree Khal to Dhara—here very little labour is required, there are village embankments generally all along, and there is jungle on the foreground, only that needs to be cleared away. But here some bunds will also be required. Thirdly, from P, to Bahmungottah or to the Nullah coming up to the Sunderbunds, the ground is high and the formation of the tracking path would be very inexpensive, and Fourthly, from the Cut into Chaytel down to the Choomooh Gong, about three-quarters of a mile, the country is inhabited, but the banks are wooded and give no tracking ground.

It would of course be desirable that the Embankment should be continued from one end of the Canals to the other, most desirable from want of roads through the country, and the straight and convenient communication these bunds might be made to afford, but they are less necessary between the points just noticed to assist the Navigation of the Canals.

From X, to the Chaytel for instance, the distance can always be performed in one tide either way, and so also from the Choomooh Gong to the Kooree Khall, and likewise from Bahmungottah to Balliaghat.

The 4th proposed short Embankment would enable light Boats to go in one tide from Cheetpore Gong to Kooree Khall in one flood* with ease, for they could readily track against the current in the Chaytel, but as that reach has a Southerly and Northerly direction in the Monsoon, it would be mostly impracticable to get over even that short distance against the tide and the wind, which there must be constantly adverse.

* Six in original.—J. M.

7. The Canals I found frequented by numerous light Boats, especially the Boats carrying *pawn* leaves, which, with 4 or 6 oars, knowing the precise periods for setting out, can always reach Calcutta from Juboona within 24 hours. The other Boats I met were generally Sawarree Boats or Boats of the intermediate country, and I also met many large return Boats; to these Boats the Canal is very useful—they have a fair wind nearly from one end to the other at that season, but by the old route, they would have had to drop down the Amjeece against a strong wind, which in their light state would have been particularly tedious. I only met 2 or 3 laden Boats of size coming from Calcutta.

8. The country on the Juboona is a particularly rich and thickly populated country, and the Canals now seem to be chiefly valuable, as connecting it and the intermediate tract with Calcutta: by the light Craft of the natives the passage by them can be made with more expedition than by the lower passage and with perfect safety, the other is often to such small Boats dangerous and frequently impassable, it is likewise almost totally through heavy jungle, whereas the Canals have the advantage of passing always near cultivation, often through it; and from Kooltee Chultabareah, with the exception of the Northern Bank of the Kooree Khall, the country is fully cultivated, and has the advantage of higher ground than any where in the vicinity of Calcutta. There can be no doubt but that the whole line of the Canals will, before long, be brought under cultivation, and the period will be shortened by every measure adopted to improve their navigableness. The establishment of a continued tracking ground and road would tend most materially to promote the extension of cultivation and to render accessible to the Calcutta markets the resources of rich and improving tracts now in a manner cut off from the want of convenient communication.

9. Besides the Embankments I have recommended, it would of course give additional value to the Canals were the shallow parts before alluded to, deepened. In the three particular points noticed near F, L, and O, the subsoil is firm; any additional cutting would

be easy, and I think of permanent advantage: for I did not observe any thing like a deposition of silt at those points, the defects are in the original construction of the Canal not owing to any subsequent filling up with mud or sand.

10th. I have only to make one further observation—it seems desirable to ascertain how far it might be practicable to increase the body of water in any portions of the Canals by damming up Nullahs to the North* of them, and so diverting their streams into the artificial Cuts. The feasibility of doing so can, however, not be well decided on without a considerable knowledge, not only of the Canals but of the other streams intersecting the country. It occurred to me that at the Eastern end of the Canals some improvement by such diversions might be effected, especially between the Gobragong and Cheetpore Gong, but from imperfect acquaintance with the Canals I am unable to do more than thus advert to the subject

(True Copy.)

G. YOUNG,

Secretary Military Board.

* / To the South—as the Nullahs to the North serve as receivers, and at the same time keep up a high level, and act as scours to the Canals —J M

No. 128.

No 1241.

FROM THE MILITARY BOARD,

To THE RIGHT HONORABLE LORD W. C. BENTINCK G C B,

Governor General in Council,

Fort William 16th July, 1833.

Department of Public Works

My Lord,

Capt. Jenkins'
Report on the state
of the Eastern Canals.

Having requested Captain Jenkins to favor us with such observations as had occurred to him on the state of the Eastern Canals during his late passage through them, we have the honor to lay before Government the annexed Copy of his reply, dated the 29th ultimo.

2. We are much indebted to Captain Jenkins for his Report, and the judicious suggestions which it contains. We have drawn the attention of the Superintending Engineer and the Superintendent to them.

We have the honor to be,

My Lord,

Your Lordship's most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer.*

A. GALLOWAY, *Lieut.-Col, Member M. B.*

D. McFARLAN, *Chief Magistrate and Member M. B.*

J. CRAIGIE, *Member M. B.*

(No. 129 omitted.)

No. 130.

No. 65.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO CAPTAIN G. YOUNG,
Secretary Military Board.

Calcutta : 24th July, 1833.

SIR,

I have the honor to acknowledge the receipt this day of your letter, No. 143, of the 16th July, accompanied by a Report on the Eastern Canals by Captain Jenkins.

2nd. I am happy to observe, that Captain Jenkins, on whose opinion the Military Board place so much value, supports my opinion on the necessity, or rather advantages of making Tow-paths along certain portions of the Eastern Canals.

3rd. The proposition or suggestion of the establishment of a continued tracking ground and Road "along the whole line of the Canals" is quite impracticable, as Captain Jenkins would have discovered if he had landed in the jungle at high-water in several places, and even a more limited extent of tracking paths of one-half the dimensions proposed, would in expence far exceed any advantage likely to arise from them. If Captain Jenkins had forwarded an estimate of the expences and the probable advantages of his suggestion, as is customary, he would have at once seen the futility of the scheme.

4th. The present Canals are more than sufficient for the intercourse with the adjoining country, supposing every Beegah of it under cultivation, as nearly one-half the land on the Banks and its vicinity is now cultivated, and the Canals would admit, without any inconvenience, of 8 or 10 times the traffic now on it.

5th. The three particular points remarked as requiring deepening, are those points where Captain Jenkins met with the low tide. The exact depths will be observed in the Appendix to my Report.

6th. The utility and practicability of damming up the Nullahs communicating with the Canals, has been considered very fully and in detail by my predecessors Major Schalch, Captain Prinsep, and Mr. Prinsep, and any remarks I could make on that subject would be superfluous.

7th. My observations on the height of the Banks and adjoining country differs from those of Captain Jenkins in many places. I do not know whether he has made allowance for the height that the tide rises to, as there are no depths of water given where the height of the Banks are remarked.

8th. These observations would have been uncalled for on my part, if I had been informed of Captain Jenkins' intended Report, when I would have had much pleasure in accompanying him on his survey.

I have, &c.,
(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 131 to No. 132 inclusive, omitted.)

No. 133.

No. 755.

EXTRACT—LETTER FROM LIEUTENANT COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces,

TO CAPTAIN G. YOUNG,
Secretary Military Board.

Barrackpore : 2nd July, 1833

" 5th. The manner of working the Locks, and quantity of water to be admitted into the Canal, can best be regulated by experience hereafter, but if the Tide be allowed alternately to ebb and flow through it as contemplated by some, a deposit of silt must be expected, which can only be removed at a considerable expence. The quantity of sand however held in solution, is much less than was supposed : for Captain Forbes has proved by experiments that a cubic foot of Ganges water, during the rains contains only a cubic inch of sand, and from similar experiments made by Mr. James Prinsep, it appears that the Sunderbunds water contains a similar proportion of silt, so that no greater a deposit may be apprehended by the admission of the Ganges water into the Canal than from that of the Sunderbunds.

Para. 7.

" 6th. Appendix A. is a rough Plan and description of one of the proposed Cess-pools, the expence of which Captain Thomson estimates at about 700 Rupees each. The plan is certainly well worth the trial, and having been found to answer in England, there is no good reason to suppose why it should not prove equally successful here, for nothing possibly can be more fatal to the Circular Canal than allowing it to remain as at present the common sewer or receptacle for all the silt and filths brought down by the City Drains, which, if not constantly removed, would soon render it unnavigable opposite to the mouths of the several Drains, and the Dredging Boats, hitherto employed for the purpose of clearing it away, prove an equal impediment to the navigation, by blocking up the Channel and leaving scarcely room for a Puntway to pass.

" 7th. Each of the City Drains has been calculated to discharge annually 100,000 cubic feet of silt, which enormous quantity is most probably owing to the earth, &c. taken out by the scavengers being usually thrown up loosely on the sides, the whole or greater part of which is consequently washed into the Drains again by the next shower of rain : this should be most strictly prohibited ; and might, I imagine, be easily prevented by the European and Native Overseers attached to the Conservancy Department, and one-half the expence occasioned by these Drains might thus probably be saved.

Paras. 25, 26.

" 8th. Captain Thomson is of opinion, that Dredging cannot altogether be dispensed with, and intends to make a trial of hand-dredging, as is practised in the Thames and in Holland ; the machinery employed is cheap and simple, and the work may be done by contract, and a trifling expence for establishment. He also suggests the expediency of using the Steam Dredging Boat in the Canals, should it ever be available for such purposes, and submits a Comparative Estimate B. of the expence of working with it and by hand labor. It may be found useful hereafter, I dare say, in clearing out the Eastern Canals in the Sunderbunds, as occasion may require. But I should hope Cess-pools may be so arranged and constructed, as to obviate the necessity of employing Dredging Boats of any description in the Circular or Ballinghatta Canals, which, as before observed, are rendered impassable, except for the smallest Boats, so long as they are at work.

Para. 9.

" 9th. The repairs and alterations here proposed by Captain Thomson, I would recommend to be effected by degrees in the course of the usual repairs, and clearing out of the

Canal—the Banks having already settled down from a slope of 2 to 3 to 2 to 1, as appears by the accompanying rough Section marked C. Another Section was taken between the Barackpore and Dum-Dum Bridge, and a third between the Balliaghatta Bridge and Entally Canal, the whole showing the same result: no further injury to the Banks, of any great extent, may therefore be anticipated.

“ 11th. Little alteration, I imagine, can be effected at present on the Northern Bank, (of the Balliaghatta Canal) without incurring considerable expence in the purchase of Ground and Houses, &c. greater part being covered with small brick Houses and Huts, leaving a bad and narrow Road between them and the Canal, which appears to be very little used,—the Road along the Southern Bank being the principal line of communication between Calcutta and Chingrahatta or the Fish Bazar, where it terminates at the Salt Water Lake.

“ 12th. The pukka Road along the west Bank of the Circular Canal is but little used except by hackeries laden with firewood, and although a good deal worn down, does not appear to require any repair at present. The space between it and the Canal, as also that corresponding on the opposite side, should be particularly attended to, all hollows filled up immediately as they appear, and the level so preserved as to conduct the water back into the side Drains of the Road, instead of allowing it to fall over the Banks into the Canal. This and such other repairs, as the Banks may require, where they have slipped in, should be executed with as little delay as possible, and the mouths of the side Drains made pukka where they enter the large City Drains, as proposed by Captain Thomson, in order to preserve them from the effects of the current.

Para. 15.

“ 17th. Within a few days after the Lock was opened at Chitpore, I understand that nearly one foot in depth of the soft mud at the bottom of the Canal was washed out by the current, the average rate of which was about a mile an hour.

“ 20th. In consequence of the crowded state of the Balliaghatta Canal throughout its whole extent, the Circular Canal may be said to be shut out from all intercourse with the Sunderbunds except for Boats of the smallest description, and must ever remain so until some arrangements are made and enforced, for preventing Boats from collecting and remaining there longer than a certain period, sufficient for the discharge or taking in of their respective cargoes, when they should be obliged to move out to the Channels North and South of Chingrahatta, and if those Channels do not afford sufficient room and convenience, Basins might be excavated at no very great expence between Chingrahatta and Balliaghatta, and the earth taken out, most usefully employed in the formation of a Towing-path along the Lake Channel, and in closing up all the outlets from the N. W. Division for the purpose of producing a stronger current than now exists in the Balliaghatta Channel, and thus clearing away the Deposit at the mouth of the Canal.

“ 21st. Tow-paths along the Khals mentioned by Captain Thomson are very much required, and when once completed should be carefully maintained in an efficient state, by cutting down the jungle every year which would otherwise spring up and render them as useless as is already the case in some parts which were cleared about a year, or a year and a half ago. Now that the rains have set in, and the Bhagretty and Jellinghy are open, the Eastern or Mofussil Canal are but little frequented, and as the season is unfavorable for such operations, I would recommend that the formation of the Tow-paths be deferred until the commencement of the cold weather, when no time ought to be lost in putting the whole into complete order, as proposed by Captain Thomson in paragraph 36.”

Paras. 32 to 36 inclusive.

No. 133. a.

No. 44.

EXTRACT—LETTER FROM CAPTAIN J. THOMSON,
*Superintendent of Canals.*To LIEUTENANT COLONEL R. TICKELL, C. B.,
*Superintending Engineer, Lower Provinces.**Calcutta : 18th June, 1833.*

“ 4th. As every future operation on these Canals will depend on the manner of working the Locks, so as to regulate the current and the height of water, I have here stated my opinion (drawn from previous Reports,) and have the honor to request your early instruction on this point. Judging from Captain Prinsep's original intention, and the subsequent Reports of many able Officers, it would appear that if a current was permitted to run always when the state of the Tide would permit) from the Hoogly to the Salt Water Lake, it would hold out many advantages over either an alternate ebb and flow, or a current from the Lake to the River. In the first instance, the water in the Canal would be deeper, and would be fresh nearly to the Lake; and I have no doubt but that, in the course of a year, the water in the nearest part of the Lake would be freshened, holding out an inducement to take into cultivation such portions of the Lake as are on a sufficiently high level for that purpose.

“ 5th. It was at one time apprehended that, if the waters of the Hoogly were admitted during the rains into the Canal, the sediment deposited would silt it up; but better information as to the quantity of earth in solution shows that no fears of this kind may be apprehended.

“ 6th. The greatest current that can be admitted into the Canal, without injury to the Banks, and the consequent height of the water at the Lock-Bridges, and other obstructions, can only be accurately known from experiment: about $2\frac{1}{2}$ or 3 feet head of water at the Lock, and about 17 inches per second velocity, will be probably near the truth; and to make my remarks on the drainage of the City of Calcutta, &c. intelligible, I shall suppose that height and velocity.

See Appendix A.

“ 7th. Considerable expence and difficulty has been anticipated in the removal of the sediment brought down by the City Drains, and deposited in the Canals. That which appears to me the best mode of preventing its admission into the Canals, and facilitating its removal, is by a Cess-pool at the end of each Drain. The large quantity of this sediment brought down by each of the Drains, 100,000 cubic feet in the year, is scarcely credible, but notwithstanding, I have no doubt of the efficiency of this method, as I have seen its success in many instances.

It is at all events worthy of trial, but I am not yet prepared with a detailed Plan and Estimate of a Cess-pool, not having sufficient information on the quantity of water discharged and some other particulars. To acquire accurate information on these points will occupy my immediate attention; but the expence may be roughly stated as follows: the sediment A Boat will take 50 Tons. 1 mile for 1 Rupee.
 $700,000 = 35,000 \text{ Tons.}$
 $35,000 \div 60 \times 3\frac{1}{4} \text{ miles} = 2,270 \text{ Rs.}$
 530 Rs. Superintendence, &c.

Probable cost of one Cess-pool.
 Excavating, Rs. 205
 Brickwork, „ 256
 Woodwork, „ 140
 Value of land and contingencies, „ 99

Rupees 700

removal, is by a Cess-pool at the end of each Drain. The large quantity of this sediment brought down by each of the Drains, 100,000 cubic feet in the year, is scarcely credible, but notwithstanding, I have no doubt of the efficiency of this method, as I have seen its success in many instances.

of the 7 Drains amounting to 700,000 cubic feet may be removed by water carriage into the Hoogly or Salt Water Lake for about 2,800 Rs. a year: removing it

Highest vis

Level of the copy (1)

The proposed alteration is shown

there being no communication between the Canal and it at Ballighatta. It is recommended that a cutcha Road be made there, 850 feet long, and 30 feet wide at top: expence about 100. Rs.

" 14th. The probable expence of making these alterations will be from 5,500 Rs. to 7,000,

Repairing and altering the Banks and Roads of the Circular Canal, and $\frac{3}{4}$ mile of Entally.

$$\begin{array}{r} \text{B} \quad \text{D} \quad \text{L} \\ 30 \times 2 \times 42240 = 25,34400 \end{array}$$

$\begin{array}{r} 730 \quad 730 \\ = 3472 \text{ choukas @ } 1 \text{ R.} = 3472 \text{ Rs.} \end{array}$
Cutting down the Road of Ballighatta Canal.

$$\begin{array}{r} \text{B} \quad \text{D} \quad \text{L} \\ 25 \times 2 \times 21400 = 10,70,000 \end{array}$$

$\begin{array}{r} 730 \quad 730 \\ = 1466 \text{ Choukas @ } 1 \text{ R.} = 1466 \text{ Rs.;} \end{array}$
making 200 Ramps.

$$\begin{array}{r} \text{N} \quad \text{B} \quad \text{D} \quad \text{L} \\ 200 \times 5 \times 16 \times 50 = 800,000 \end{array}$$

$\begin{array}{r} 730 \quad 730 \\ = 1096 \text{ Choukas @ } 1 \text{ R.} = 1096 \text{ Rs.;} \end{array}$

$$\begin{array}{r} 3472 \\ 1466 \\ 1096 \\ \hline 6031 \text{ Rs.} \end{array}$$

as to induce me to recommend the Road being made pukka on that side, except at the Basin, where it is now nearly finished by Mr. Prinsep: with respect to these Roads generally, I would think it not necessary to expend more than is required to preserve the Banks of the Canal;

Making Pukka mouths of Drains about
 $\begin{array}{r} \text{N} \quad \text{B} \quad \text{D} \quad \text{L} \\ 60 \times 5 \times 1 \times 10 = 3000 \text{ cubic feet} \\ 3000 \text{ cubic ft. @ } 16 \text{ Rs. per } 100 \text{ ft.,} = 480 \\ 8000 \text{ yards of cutcha Drains @ } \frac{1}{2} \text{ Rs. per } 100 \text{ ft.,} \dots = 400 \end{array}$

Rupees 880

proposed is to make the mouths of these Drains pukka at the place they enter the large Cross Drains, in order that the current may not alter their slope, and thereby cut away the Roads and Banks of the Canal. I estimate this at about 800 Rs.

" 16th. The Bridges over the Circular Canal are in nearly the same state as when reported on by the Committee (9th August 1831), as I am informed: all the standards of the Narkuldanga and Manicktollah Bridges are cracked in a degree more or less, particularly the former Bridge. The Sketch of the N. E. Pier will show the direction of them. These cracks are reported to have been caused by hanging the Bridge on the chains. There were no rollers under the chain, and they necessarily dragged the standard forward. These cracks change with the temperature of the day and night, and there was a perceptible alteration in them, caused by the gale of the 22nd ultimo. The bolts of the back chains of these two Bridges appear bent and injured materially by the manner in which they have been wedged. The bolts of this Bridge are nearly 2 inches in diameter, which is about half the strength they ought to be.

" 17th. If the Narkuldangah Bridge had not stood so long as it has done in its present state, I should have considered it unsafe. I will forward an Estimate of Expence of rebuilding the standard and repairing the ironwork, if called for. And if it is repaired, I will be able to judge from the state in which I find it, whether the Manicktollah [Bridge] will require a similar alteration.

Instead of $2\frac{1}{2}$ inch.

" 18th. It will be found expedient, as soon as the Locks at Chitpore are open, to procure ballast to throw down to protect the Banks of the Canal at the following places:

Foot of the east wing walls of Locks, about	..	..	..	..	50	Tons.
Ditto ditto, of 4 Bridges,	..	..	..	..	30	"
or 3,	..	..	..	..	90	"

This may be done for about 50 Rs. 170 Tons.

" 19th. With regard to keeping an accurate account of the shoaling of the Canal at particular points, I have met with difficulties I did not expect; generally throughout the Canals but more particularly in the Circular Canal, I found the mud so very soft that I could not determine the depth of water within 6 inches, and that approach to accuracy was made by the mark of the mud upon a white coloured rod being deducted from the total depth. The soft mud is in the Circular Canal, from 18 inches to 2 feet deep, and will most likely be carried away by the current when it is admitted from the Hoogly.

" 20th. I will pursue the following method of ascertaining the shoaling: Gauges will be fixed at every mile of the Canals, and 6 to 8 sets of soundings in the year will be made with such accuracy as may be practicable, and although no two sets may agree, yet an average of several will approach to accuracy.

" 27th. The work to be done on these 2 Canals may be summed up as follows.

" 28th. Whenever the Bank has fallen in or requires much repair, the section of the Canal will be made according to Sketch proposed. The Bank and Road along the north side of the Ballighatta Canal to be then completed; and at the same time the Ballighatta Road repaired, and the cross Road at Chingreechatta made when authorized. The other repairs and alterations will be made when I receive instructions to that effect.

" 29th. Immediately connected with the Circular and Ballighatta Canal is the entrance* of the Eastern Canal, which is liable to be choked up by the sediment brought down from the former Canals.

* At Chingree-hatta.

" 30th. The current admitted into these Canals at the Locks will have but little influence on this point, as it will meet the rising tide about that place. And when the tide falls, the current out of the Canals will not much exceed what it now is, because the Canal will be on a higher level than the Lake, the current from which will be thereby prevented entering the Eastern Canal at Ballighatta. It has been proposed by Mr. J. Prinsep, and I believe already approved of by the Military Board, to make Tow-paths along the Lake Channel. If the Embankment for the path is made along the N. E. side of the Lake Channel so as to close up all outlets from the North-western division of the Lake, except the one at Ballighatta, the Lake would serve the purpose of a reservoir to clear out the head of this Canal.

" 31st. Mr. Prinsep has pointed out to me the convenience to the public of a place to lay up empty Boats, &c. by deepening and cutting many more Docks in this Channel opposite to Ballighatta. If the current therefore, at a moderate expence, can be forced through this Channel, great advantages would arise from it. The particularity [? practicability] of it can only be ascertained by experiment or trial, as it would be impossible to take accurate levels on the Lake.

" 32nd. It will be remarked by a reference to the Appendix, that little or no change has taken place in the Eastern or Mofussil Canals. Doubts have been raised respecting the utility of these Canals; and I am not prepared from personal observation to form an opinion on this subject, and consequently to propose or recommend any considerable expenditure in order to put the Banks in proper order so that they would remain permanent, or for digging out any of the shallows. But there is one very great drawback to these Canals in the want of Tow-paths between one Canal and another at the several places remarked in the

Mofussil Canals.

Appendix. With these Tow-paths and very ordinary precaution on the part of those passing through the Canals, there would be no stopping and losing a tide as they are sometimes obliged to do now, either when the Boats are large and heavy, or a strong wind against them; at present the water is too deep to pole and the jungle too thick to track, but with Tow-paths of one mile or less they might go on to the next Canal, where the current would be either in their favour, or they could track through it and get a favourable current at the next Khal or Nullah.

" 33rd. The work proposed during the ensuing season, therefore, on the Sunderbund Canals and navigation, is making a tracking path along one Bank of the following Nullahs, viz :—
 From the Tarda Nullah to the West end of the Bhaminghatta Canal, .. 900 yards.
 Along the East Bank of the Sealda Khal to the Chytul Canal, .. 1,300 yards.
 Along the South Bank of the Hinshee Khal to the Bhawannypore Canal, .. 1,600 yards.

3,800 yards.

" 34th. The Tow-paths along the whole length of the Canals require to have the jungle cut, and the ground to be levelled in many places.

" 35th. The 3,800 yards of Tow-path might probably be done for 1,100 Rs.; but it is entirely conjecture, as I have no data to go upon. The manner in which Mr. Prinsep recommended might be adopted, viz. by keeping a gang of 20 or 30 men constantly employed until they finished the work.

" 36th. The manner of making the Tow-paths proposed, would be to leave about 15 or 20 feet of the jungle near the Bank to preserve it, but to cut it down to 3 feet in height, and then to raise a Bund about 10 feet wide at base, and 18 inches high, by earth taken from the inside."

(True Copy.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 133. a.^(1.)

A.

Rough Plan of the proposed Cess-pools.

June 23rd, 1833.

The general idea of the Cess-pools may be formed from the following description :

The Cess-pool will be about 60 feet by 50 feet at bottom, and rivetted there by walls 2 feet high, the sides will be sloped (2 to 1), and covered with grass; the level of the top of the rivetment Walls will be about 2 feet above the mean level of the Canal A. Wall B, will be built across the present Drain, and projecting into the Cess-pool 10 or 12 feet, to carry the current into the middle of the Pool.

The Cess-pool is supposed to contain one hour's water, during which time it is supposed that the mud will be deposited. From C to C is an opening back again into the Drain, with a grating as seen in section 3. The area of this grating will be so much larger than the Drain that the velocity of the water passing through it will be so much reduced, that only the lightest part of the mud, held in solution will be carried into the Canal: and as the quantity of sediment held in solution bears a certain proportion to the velocity of the current, the Canal at 17 inches in a second will easily carry into the Lake the mud brought down by the Drains from the Cess-pool.

As far as my information goes, a Cess-pool of the size described, will hold more than all the sediment brought down by a rain of 4 inches in 24 hours in the largest of the Calcutta Drains. It would have to be cleared out every day while such rain continued, and as the Drains are in pairs, and there would be a Cess-pool to each, if a communication was made between the Drains under the Road, each of them alternately might be laid dry so as to dig the filth out as required.

No. 133. a.^(2.)

B.

Comparative Estimate of Dredging up the sediment from the Circular and other Canals by the Steam Dredger and by hand labour.

The Steam Dredging Boat is 24 feet wide, and draws 6 feet water, and has an engine of 14 horse power; it raises on an average in mud and sediment 75 tons per hour—burns 170 lbs. of coals per hour.

Description of the Boat.

The cost, independent of fuel and repairs, is as follows:—

Establishment,	Rs.	190
Engineer's Salary, .. .. .	..	350
		<hr/> 540

And when Working—

Coals 170 lbs × 10 hours × 25 days = 600 maunds, @ 8 As.	..	300
Repairs, .. .. .	..	150
Receiving Boats, .. .. .	..	110
		<hr/> 560
		<hr/> 1,100

Work Done.

Tons. Hours. Days.

75 × 10 × 25 = 18,750 tons, @ 1,100 Rs.

equal to Rs. 5-14 per 100 tons.

Or, if the expence of Working only is considered, it will be—

Tons. Tons. Rs.

18,750 : 100 = 560 : 3 per 100 tons.

A Chouka of mud is equal to about 35 tons, and the average cost of excavating the Canal was at 1 Rs. 6½ As. per Chouka, or 4 Rs. per 100 tons.

The probable quantity of sediment to be excavated annually may be stated 45,000 tons :

Expence by hand labour.

45,000 tons @ 4 Rs. per 100 tons =	.. .. .	1,800
Making and dredging three Bunds @ 50 =	.. .. .	150
Pumping and Baling, .. .. .	.. .. .	50
		<hr/>
Yearly expence,	Rs. ..	2,000

Dredging Boat.

45,000 tons @ 5-14 per ton, .. .. .	.. .. .	2,643
45,000 tons @ 3 per 100 tons, .. .. .	.. .. .	1,350

It will be borne in mind, that dredging to a certain extent must be resorted to, and a constant expenditure under this head allowed for.

The present expence of keeping up this Boat may be stated at 6,000 Rs. a year, which expenditure might be reduced to 5,300 by employing it on the Circular Canal, and if used in the other Canals it might cover its whole expenditure. Probable value of this Boat 40,000 Rs. and fitting it for the Canals from 500 Rs. to 3,000 may be necessary, according to the state of the machinery and stores.

J. THOMSON, Captain,
Superintendent Canals.

June 23rd, 1833.

No. 134. a.

No. 61.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO LIBUTENANT COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 10th July, 1833.

SIR,

Sections of the Tides
in the Circular Ca-
nal forwarded.

I have the honor to forward a section of the Tides at high-water in the Circular Canal when the Gates were left open; these three Tides are the mean of about 20 measured Tides, which agreed within 2 inches on the Guages.

Velocity of current
in the Canal with
the consequences.

2nd. The strongest current through the Locks was at about 4-5ths flood, and was 3 and 1-10ths miles per hour, or 53 inches in a second; at which time the current under the Bridges was about 18 inches in a second and 14 or 15 in the Canal, except at the middle of the Balliaghatta Canal, which is much obstructed by Boats, and is very narrow. The current at this place was not measured, but appeared to be about 40 or 50 inches in the second; it has injured the Bank not so much from the current as by the Boatmen driving stakes into it and pulling it down. The Magistrate has remedied this evil.

Proposed remedies
for these.

3rd. It appears from this trial, that a sufficient current cannot be got in the Circular Canal unless the Banks of the Balliaghatta Canal are injured, or the empty Boats removed out of the latter Canal, and the section in the middle and other narrow parts made equal to that of the Circular Canal. These latter alterations are recommended in my Report.

Effect of removing
the sunken Boats.

4th. The section of the highest Tide on the Salt Water Guage, was taken when all the obstructions of sunk Boats were removed from the Balliaghatta Canal: the effect is apparent.

I have, &c.,

(Signed) J. THOMSON, Captain,

(True Copy.)

Superintendent of Canals.

(Signed) R. TICKELL,

Superintending Engineer, Lower Provinces.

(No. 135 to No. 137 inclusive, omitted.)

No. 138.

No. 2202.

EXTRACT OF A LETTER FROM THE MILITARY BOARD,

TO THE RIGHT HONORABLE LORD W. C. BENTINCK, G.C.B.,

Governor General in Council.

Fort William: 10th September, 1833.

Dept. of Public Works.

"We have the honor to submit copies of the Documents noted in the margin,

Letter No. 755, dated the 2nd July, from the Superintending Engineer, Lower Provinces.

Ditto No. 44, dated the 18th June last, from Capt. Thomson, and Appendices A. B. C. D.

Ditto No. 904, dated the 16th July, from the Superintending Engineer, Lower Provinces, and enclosure.

Ditto No. 1245, dated the 19th ultimo, from ditto and enclosure.

on the subject of the Circular and Moofussil Canals.

"2. The Chief Engineer and Lieut. Colonel Craigie consider this first Report by Captain Thomson on the Canals to be very creditable to him, and to indicate a mind of science and resource, as well as a judicious observation of the important works which have been committed to his charge,—we approve of

the review taken by the Superintending Engineer of Captain Thomson's Report.

N.B. The

Thomson Capt.
Capt. Canals

AND THE DEJECTIVE STATE OF THE DAMS ALLUDED TO IN THE 5TH PARAGRAPH, DEMANDS OUR
SERIOUS ATTENTION; FOR EVERY POSSIBLE PRECAUTION OUGHT BE ADOPTED TO LESSEN THE ENORMOUS
QUANTITY OF SOIL THAT APPEARED TO BE ANNUALLY WASHED THROUGH THEM INTO THE CANAL, AND WHICH,
UNLESS THE EVIL BE EFFECTUALLY OVERCOME, WILL, I FEAR, INVOLVE A VERY HEAVY ANNUAL EXPENCE, OR

render the Circular Canal of little more use than as a mere receptacle or sewer to the Town of Calcutta. I have therefore directed Captain Thomson to prepare the requisite Plans and Levels, &c. and to submit an Estimate of the probable expence of executing the measures he now suggests, which appear to be extremely necessary, whatever other Plan may eventually be decided on for keeping open the navigation of the Circular Canals.

I have, &c.,

(Signed) R. TICKELL, *Lieut. Colonel,*
Superintending Engineer, Lower Provinces.

No. 146. a.

No. 89.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO LIEUTENANT COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 8th October, 1833.

SIR,

Although I am not yet prepared to make a definite proposition for preventing the mud and filth being brought by the Drains of Calcutta into the Circular Canal, yet I consider that the quantity brought down might be reduced to nearly one-half by the following alterations in the Drainage of the ground between the Circular Road and the Canal. This ground is under the charge of the Magistrate of the 24-Purgunnahs.

2nd. During some of the heaviest falls of rains in the months of July and August last, I visited the principal Drains leading into the Canal, particularly the Narculdangah Drain, which is most injurious, and to which my remarks shall principally refer. It has so happened this year that no shower of rain has fallen exceeding 22 inches in the 24 hours, and the Drains are capable of draining off about 4 inches in the 24 hours. The greatest current that I observed in the Narculdangah Drain was 3 feet 9 inches in a second, with a depth of 1 foot 6 inches and width of 6 feet, or about 9 square feet, with a mean velocity of about 1 foot 2 inches per second; or 10 cubic feet in a second. This is about one-third of what the Drain is capable of doing. It was further observed, that the greater part of the filth brought by the Drain in question was received from the Cross Drains to the East of the Circular Road, particularly the East Drains of this Road, and it has been a common practice to take up the mud in this Ditch, after heavy rain, so that it may be carried away by the current in the Drain, and save the expence of cleaning it out, but causing an expence of 6 times as much in cleaning out the Canal.

3rd. My proposal is, that the mouths of all the Cross Drains leading into the principal Drains in the district between the Canal and the Circular Road be built up to within 1 foot 6 inches, or 2 feet of the surface of the ground, or so high that the water in the Cross Drains shall not run in them with a greater current than 1 foot in a second. The anticipated consequences will be, that in a year or two they will be filled up to the height of the Dam across their mouths, and the current so much reduced that no filth will be brought down by them that cannot be removed by the current in the Canal.

4th. My attention to this simple plan was called by Mr. Prinsep, who has reported that he had partially closed up the mouth of one of the principal Drains leading into the Circular Canal, on the theory of making

Filth brought by the
Drains into Circular Canal.

Quantity of water deli-
vered by these Drains and
the source of filth.

Proposed remedy.

Mr. Prinsep's experiment
on the subject.

the Drain itself act as a Cess-pool by reducing the velocity of the current through it. The experiment was successful in as far as the sediment was deposited in the Drain to the height of the Dam, and if this filth had been dug out as it accumulated, it would be all that was required. But the water-way left by the Dam was not intended to pass the water that falls during the rains, and the Dam of course removed previous to them.*

* Sic in original.
—J. M.

5th. Although the principal Drains are not under my charge, yet I take the liberty of Drains not all rivetted, remarking, that a considerable portion of them are not rivetted, recommended to be so. and the Banks are liable to fall, or be washed in, which is another cause of sediment so frequently remarked.

6th. In order to Estimate the expence likely to be incurred in carrying this scheme into effect, I would require Plans, Levels, and other measurements, which my Surveyor Mr. Turner will undertake, if the project meets your approbation.

I have, &c.,
(Signed) J. THOMSON,
Superintendent of Canals.

(True Copy.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

Resolution.—Agreed to acquaint the Superintending Engineer, that the Board approve of Captain Thomson's proposal, and of the instructions he has given him on the subject.

(No. 147 and No. 148 omitted.)

No. 149.

No. 2823.

FROM THE SECRETARY MILITARY BOARD,

TO CAPTAIN JOHN THOMSON.

Fort William: 25th October, 1833.

SIR,

I am directed by the Military Board to request, that you will Report what was the effect on the Circular Canal of the admission of a current from the River on the 28th ultimo.

I am, &c.,
(Signed) G. YOUNG.

No. 150.

No. 105.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN G. YOUNG,

Secretary to the Military Board.

SIR,

Calcutta: 12th November, 1833.

I have the honor, in reply to your Letter No. 2823, of the 25th ultimo, to report on the effect of the Circular Canal of the admission of the current from the River on the 27th September last, and also on the state of the Canal generally.

2. I sent with this Report a tracing of the section of the Circular Canal, in which the height of the water on the 27th September is marked, the usual height being at zero. The black line marking the bottom of the Canal is the mean depth derived from a number of soundings ending on the 1st of August, and when the Lock-gates having been shut the mud in the Canal began to accumulate. The red line marks the average of soundings taken between the 27th of September and the present time. From the sickness among my people who take the soundings, I had only one set previous to the 27th November, and that set having been taken by a different person, from those accustomed to do so, I could [not] derive any information from it.

3. In my report on the Canals, I stated the difficulties and uncertainty of soundings in the Circular Canal, this is very apparent in the accompanying sketch, and will account for my inability to give any satisfactory information, either of the quantity of sediment brought down by the Drains or the proportion which may have been removed by the current admitted on the 27th November.

4. The velocity of the water in passing through the Lock at the surface was 12 feet per second, and the mean velocity 10 feet 3 inches. The discharge therefore through it was 3,700 cubic feet in a second. The current under the Barrackpore Bridge was influenced by that through the Lock, but at the Manicktollah and Narkuldanga Bridges it was conjectured to be 5 feet in a second. In the Balliaghatta Canal the current appeared to be 6 feet per second, and there was about 1000 yards of length from 1 foot to 1½ foot of the South Bank cut away. I expected much greater damage to have been done, but 3 or 4 Boats having been sunk, a great many of the proprietors of the other Boats took the alarm and employed a number of men to track their Boats into the Entally Canal along the South Bank, which in a great manner preserved it. There were several places in the Circular [Canal] slightly injured in consequence of the strong wind that was blowing contrary to the current in some of the reaches. This was most apparent near the Ultadanga Bridge, where the Canal has passed through old Tanks, and has its Banks formed of loose earth. In consequence of one of the broken Gates laying across the Lock the current was thrown to the North side of the Basin, where the Dredging Boat was moored: these circumstances caused a strong eddy, which cut out the bed of the Canal to a depth of 12 or 14 feet. This injurious effect had been increased by a Bund on the South side, which could not in July last be removed by the Dredging Boat in consequence of the hard nature of the ground of which it was formed. The earth excavated by the above-mentioned cause has apparently been deposited along the bed of the Canal about 1½ foot deep, as far as the Dum-Dum Bridge.

5. I took soundings, as I before mentioned, on the morning of the 27th November, before the Gates were opened, and next succeeding morning, from which it appears that opposite the Manicktollah and Narkuldanga Drains the current deepened the water from 2 feet 9 inches to 5 feet 3 inches at one Bridge, and to 3 feet 9 inches at the other; 1-3rd of which earth, or 5,000 cubic feet from each Bridge, was probably removed into the Lake, and the remaining 2-3rds distributed over the bed of the Canal.

6. From the nearest calculation I can make, the average quantity of sediment deposited by each Drain into the Circular Canal is about 20 or 30,000 cubic feet, the Durrumtollah Drain has deposited, however, 70 or 80,000 cubic feet in the Entally Canal, but the fall of rain this year has been scarcely one-half of the usual quantity, and it is the principal cause of this deposit.

7. The Banks of the Entally Canal between the Coolya Bridge and the Circular Canal slid during the rains in three different places, which will partly account for the shallowness of that part of the Canal.

8. Although the sediment left by the Drains this season might be dredged out for 1,000 Rs. or 1,200 Rs. yet there are five or six Bunds on which there is only 4 feet 9 inches water, which are too hard to be removed

26,000 cubic feet from 7 Drains = 250 Chowkas, at 4 Rs. per 1,000.

by dredging, and can only be dug out by the Canal being laid dry: if the Canal is laid dry for this purpose the earth opposite the Drains may be removed for 400 Rs. or less. It was proposed by the Committee of Engineers, dated January 1832, to lay the Canal dry, and commence with a great number of men, upon the whole length of it, and thereby only close the navigation for 14 or 15 days—but as the Bunds nearest the River must be removed before the water can be run off so as to dig out the next one, they must be removed in detail, and the time occupied will be 6 or 7 weeks for the Circular Canal alone, and it may not be expedient to do any thing to the Balliaghatta and Entally Canals this year.

9. The loss of Revenue from the Circular Canal being closed from 1st December till the middle of January will be but trifling, compared with closing up the Balliaghatta Canal, or waiting a month later when the Boats going to the Upper Provinces may have commenced passing through the Lock.

10. The large quantity of sediment brought down by the Durrumtollah Drain, and the very favorable situation for a Cess-pool at the mouth of it, induces me again to recommend its construction. I will send a plan and estimate as soon as I can find time to take the requisite levels and measurements.

11. If the Canal is to be closed and dug out, I will require the authority to do so by the 1st of December. I will in the mean time commence on the removal of the Bunds between the Lock and the River as soon as the Tides will permit, charging the amount in my current expences, if the authority above-mentioned should not be granted.

The Estimated expence of laying the Circular Canal dry, and digging it to an uniform depth of 7 feet is 1,479 Rs., but as much will depend on the Tides and the dryness of the season, a contingency of 500 Rs. will have to be added to this, as Draining may be found necessary.

Estimate—mean length 10,500 feet.	
mean depth 1 foot 3 inches.	
mean breadth 33 feet.	
570 Choukas at 2-8 Sa. Rs. ..	1,425
A Bund, 20 + 7 + 50 = 7000 c.	
feet, or 9 Choukas at 2 = ..	18
Dredging ditto at 4 = ..	36

Contingency, ..	1,479
	521
	<hr/> 2,000

When the Circular Canal is again opened, and the season would permit, it might be found advisable to close the Entally Canal and dig it out in a like manner as far as the junction of the Circular Canal. This Canal was dug

out as far as the Coolya Bridge two seasons ago, but it is at the present moment quite dry for 100 yards, and may be expected to be entirely closed up in two seasons more.

Judging from the expence already incurred on this Canal, an annual expenditure of 2,500 Rs. may be expected in future, principally caused by the difficulty in the disposal of the earth that may be dug out of it. The earth brought into the Canal by the Durrumtollah Drain cannot be expected to be reduced in quantity, but it could be removed from a Cess-pool for about 250 Rs. a year, and as no ground is to be hired on which to deposit it (independent of the nuisance of such plan) it must be carried into the Salt Water Lake at a cost of 500 Rs., and if the plans already proposed for preventing the sliding and washing in of the Banks are adopted, the annual expenditure may be kept within 900 Rs.

No. 151.

No. 3252.

FROM THE SECRETARY MILITARY BOARD,

TO CAPTAIN J. THOMSON.

SIR,

The Military Board understand that the section of the Balliaghatta Canal is not equal to that of the Circular, and more particularly that the depth of the former is not equal to that of the latter.

See Prinsep's Survey.

2. If this be the case, it appears to the Board that the clearing away of Bunds in the Circular Canal and the removal of deposit in it, ought to be contemporaneous with the widening and deepening of the Balliaghatta Canal, or on the other hand, if the latter is not undertaken the former would be premature and ineffectual, except indeed as forming a deeper Cess-pool for the deposit brought down by the Drains.

3. The Board request, that you will state your opinion on these points with as little delay as possible.

No. 152.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN G. YOUNG,

Secretary to the Military Board.

Calcutta: 22nd November, 1833.

SIR,

The mean section of the Balliaghatta Canal is about one-fourth less than that of the Circular Canal, but this difference is much increased by Boats. The sections may be stated as follows:—

The Circular Canal,	..	..	..	..	..	..	..	280	Sr. feet.
Balliaghatta Canal,	..	..	..	..	..	..	..	210	Sr. feet.
Ditto ditto reduced by Boats,	..	..	..	..	..	..	..	160	Sr. feet.

2nd. The consequence of this difference of section is, that as the Banks of the Balliaghatta Canal will be injured by a current exceeding 3 feet in a second, the current in the Circular Canal will be reduced to less than 2 feet.

3rd. By a better arrangement of the Tolls and other Regulations for these Canals, I anticipate that the Boats now lying in the Balliaghatta Canal will be equally distributed over the Circular Canal, and when this latter is dug out to a section not less than 350 square feet, the proportion between the two Canals will be about the same as before, or as 3 to 2.

4th. If the current was running from the narrow Canal into the wide one the latter would act as a Cess-pool, but when it runs from the greater into the less, the only disadvantage is, that the benefit of the greater current, viz., 3 feet in a second, is not to be had for the purpose of removing the filth brought down by the Drains. To remove this disadvantage by digging out the Balliaghatta Canal to an equal section with the Circular Canal, would cost 5 or 6,000 Rs., whether this is an equivalent I cannot at present give an opinion, until the Tides are permitted to run through the Canals for one season. Some of the Bunds too hard to be dredged, are not cut to a depth equal to that of the Balliaghatta Canal, and therefore obstruct the navigation. If the Canal is laid dry for the purpose of removing these, the additional expence of digging out 1 foot or $1\frac{1}{2}$ foot more in depth than the Balliaghatta Canal will not be considered of any consequence, when the necessity of laying the Circular Canal dry next season may be thereby avoided, and in the intermediate time, circumstances may not require this expence on any future occasion. When the hard Bunds are removed and the side sediment from the Drains accumulates during the rains of 1834, the effect of the current admitted during the spring of 1835 would then decide what other means may be necessary for keeping open the navigation. I do not anticipate any at present, except in the Entally branch of the Canal.

(True Copies.)

G. YOUNG,

Secretary Military Board.

(No. 153 to No. 160 omitted.)

No. 160. a.

No. 126.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO LIEUTENANT COLONEL R. TICKELL, C. B.,

*Superintending Engineer, Lower Provinces.**Calcutta : 9th December, 1833.*

SIR,

With reference to the 7th paragraph of the Military Board's Letter, No. 2198, calling for Estimates of the expence of constructing the Embankment and for executing the Basins adverted to in the 19th and 20th paragraphs of my Report on the Canals, I have the honor to forward an Estimate for the Embankment, and to Report, that the effect of closing up the Nullahs and forming the Embankment, will be to cause a strong current into the Lake past Balliaghatta, which will, in a few months, make a Channel 9 or 10 feet deep. This Basin could not be made by Dredging, because the soil is too stiff, and it could not be excavated in $3\frac{1}{2}$ feet water, except at an expence of 15 or 20,000 Rupees.

2. The Basin and Docks now at Balliaghatta, which are the property of individuals, will hold 150 or 200 Boats; and all that is required, is that the Basin and the entrance be deepened to 6 feet in the dry weather, or about 7 on the guage, which will be effected by the plan proposed.

3. It is not intended that all the Nullahs connecting the South-west Lake to the Lake Channel, should be closed up, because the proposed opening at Balliaghatta would be insufficient for Draining the Lake of rain water that might fall; it is therefore proposed to close up the connecting Nullahs in succession until a current of 3 or 4 feet per second is got through the Channel at Balliaghatta. The current at present does not exceed 9 inches per second.

If the Lake is, at any future period, Drained, the proposed Tow-path will have to be raised $1\frac{1}{2}$ foot, at a very trifling expence, and no alteration whatever will probably be required to the proposed Basin and Docks.

(True Copy.)

(Signed) R. TICKELL, *Lieut.-Colonel,**Superintending Engineer, Lower Provinces.*

(True Copy.)

G. YOUNG,

Secretary Military Board.

No. 161.

No. 4676.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.,

*Vice-President in Council.**Fort William : 14th February, 1834.*

Department of Publick Works.

HON'BLE SIR,

Submitting an Estimate by Capt. Thomson for prolonging the North Bank of the Balliaghatta Canal, &c. with Copy of a Letter from that Officer.

With reference to the 1st paragraph of our Letter, No 2202, of the 10th September last, we now beg to submit for the consideration of your Honor in Council, the under-mentioned Estimate, together with Copy of a Letter from Captain Thomson, (No. 126, of the 9th December last,) and to recommend that the proposed

expende be sanctioned. Estimate (No. 235, Book B of 1833-34, M. B. O.) by Captain J. Thomson, Superintendent of Canals, of the probable expence of prolonging the North Bank of the Ballialghatta Canal and Bunding several Nullahs, &c. in order to draw a stronger current into the Lower Lake past Ballialghatta, amounting to Sicca Rupees 3,400 : 0 : 0.

2. The rates of earthwork have been examined, and although high, may be considered admissible with advertence to the nature of the work, a great portion of which will be under water.

3. This work will probably afford some criterion as to the expence of the Bunding Work that will be required in Draining the Salt Water Lakes, and may be considered as a first step in that work.

4. Lieut.-Colonel Galloway does not recommend this Estimate, because, in the event of warping the Salt Water Lake, a measure at present in the contemplation of Government, the Bund and work here Estimated for, will not, in Lieut.-Colonel Galloway's opinion, be at all required; and for an explanation of this opinion he begs to refer to his Minute on the Draining, &c. of the Salt Water Lakes, submitted to Government with our Letter of the 7th instant.

5. The majority of the Board are disposed to rely on the recommendation of Colonel Tickell and Captain Thomson. The prolongation of the Circular Canal South-eastward, clear of the Lake, would render the work now proposed unnecessary. But that is a measure not likely to be undertaken with reference to its expence compared with its usefulness and urgency.

We have the honor to be,

Hon'ble Sir,

Your most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer, Member Military Board.*

A. GALLOWAY, *Lieut.-Colonel, Member Military Board.*

D. McFARLAN, *Chief Magistrate, Member Military Board.*

(*No. 162 and No. 163 omitted.*)

No. 164. a.

No. 157.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 12th February, 1834.

SIR,

When I forwarded my Plan and Estimate of the Cess-pool in the Entally Canal, I intended that it should have been a pattern after which others might have been constructed, I therefore entered into all the reasons, explanations and details that I could suggest to meet every emergency: it appears I have thereby rendered my description confused and unintelligible.

2nd. Agreeably to the orders contained in the 2nd paragraph of your Letter No. 2846, I send a revised description of Plan and Estimate.

3rd. I have only to remark, that the height of the rivetment is determined by the highest rise of the water in the Canal, and not by the sill of the Drain, because if the

rivetment did not rise to the height of the highest rise of the water in the Canal, it would not retard the current and cause the sediment to be deposited.

4th. The length of the Cess-pool, viz. 300 feet, was adopted by me because on a depth of 6 feet it would hold one year's deposit, and cleaning it out annually, as originally intended, would certainly be preferable to cleaning it out every fortnight, the expence of pumping the water out in the first case, being balanced by the expence of Establishment in the other. The description of cleaning out every 15 days had reference to any other Cess-pool that may be constructed, and where the space was limited.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.)

(Signed) R. TICKELL, Colonel,
Superintending Engineer, Lower Provinces.

Estimate (No. 311, Book B. of 1833-4, Military Board Office, with a Plan) by Captain Thomson, Superintendent of Canals, of the probable expence of constructing a Cess-pool in the Entally Canal, amounting to Sa. Rs. 569-10-4.

Minute by Chief Engineer.—The original Plan does not accompany these papers, which I wish it did, because I am inclined to believe this Plan deviates in some measure, though not essentially, from the former, though not altering the principle of Captain Thomson's scheme, which I quite well understand; it matters little whether the water is let off instanter after a deposit has been made, or allowed to remain for the deposit of 6, 9 or 12 months or more, all will be regulated by the top or summit of the Dam, which however, the clearing out of the deposit [if] effected, must be of a height sufficient to *keep out spring-tides from the Canal below the Drain*. The Dam may have a sliding Sluice of boards which would allow of letting off the clear water in the Cess-pool at pleasure, and clearing away the sediment whenever it was required. I think Captain Thomson is clear enough in his Plan and detail, at least as far as my comprehension serves me to recommend the Estimate.

(Signed) THOMAS C. ANBUREY.

Minute by Lieut.-Col. Galloway.—Recommend. (Signed) A. GALLOWAY.

Minute by Chief Magistrate.—Recommend all but that part of the scheme which purposes to raise the rivetment higher than the sill of the Drain, that would have the effect of retaining back-water in the Drainage, and until the boards were taken out to let off the Cess-pool water, this retention of back-water would be objected to by the Magistrates in the Conservancy Department in the Town.

The highest rise mentioned by Captain Thomson, no art can protect us against—it must be allowed to advance up the Drain for a time and recede. The raising of a rivetment wall higher than the sill of the Drain would not mend that matter; it would however infallibly cause a back-water in the Drain on every occasion of heavy falls of rain which [would] last till the Sluice was opened, to raise it a little higher, and you will submerge that part of the Town, the Drainage of which depends upon the Dhurumtollah Drain, cutcherry* sediment enough no doubt; the top of the rivetment should therefore be 6 inches at least lower than the sill of the Drain.

* Sic in original.
—J. M.

(Signed) D. McFARLAN.

Resolution.—Agreed to address the following Letter.

No. 165.

No. 5369.

To THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

With reference to your Letter No. 2998, of the 22nd ultimo, I am directed by the Military Board to say, that they have doubts as to that part of Captain Thomson's scheme which proposes to raise the rivetment higher than the sill of the Drain, which would have the effect of retaining back-water in the Drains until the boards were taken out to let off the Cess-pool water. This retention of water would be objected to by the Magistrates in the Conservancy Department of the Town.

2nd. The highest rise mentioned by Captain Thomson, no art can protect against—it must be allowed to advance up the Drain for a time, and recede—the raising of a rivetment wall higher than the sill of the Drain, would not mend that matter. It would however infallibly cause a back-water in the Drain on every occasion of heavy falls of rain which would last till the Sluice was opened.

3rd. It is true, as Captain Thomson says, that if the front Wall of the Cess-pool be not higher than the highest flow of the Tide, water will flow into it, but it is not true that this flow will be that of a current possessing strength sufficient to obstruct materially the deposit of sediment in the Cess-pool, it will be rather a swell than a current in the opinion of the Board, and as the Tide ebbs, there will be time for the subsiding of the matter contained in the reservoir.

4th. You will acquaint Captain T. with these remarks, and request him to submit his opinion on the subject, previous to the Board's decision with regard to the Estimate.

I have, &c.,

MILITARY BOARD OFFICE:

(Signed) E. P. GOWAN,

21st March, 1834.

Officiating Secretary, Military Board.

(No. 166 to No. 170 omitted.)

No. 171.

No. 197.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

To CAPTAIN E. P. GOWAN,

*Officiating Secretary, Military Board.**Calcutta: 25th April, 1834.*

SIR,

I have the the honor to forward the following remarks on Mr. G. Prinsep's letter called for by the Military Board (Letter No. 5948, 22nd April).

2nd. In the 6th para. of the letter Mr. G. Prinsep states, "when the small experimental work was planned and laid out in 1828-29, and again when it was extended in 1829-30," the plan of the Chitpore Canal had been sanctioned, and the digging of it already begun, I was perfectly acquainted with the details of all the scheme, and especially with the plan

of the Locks. The scheme of the Canals and plan of the Locks may be briefly stated as follows : Major Schalch's matured plan was, that the head of the Circular Canal, leading out of the Hoogly River, was to be left entirely open, except some months in the rains, at which time a Log-Dam was to be put down at Barrackpore or Ooltadanga Bridge, Captain Prinsep's first scheme in 1826 was to make Sluice or Flood-Gates instead of the Log-Dam, so as to have the Canal open and navigable at all seasons of the year, except during the spring-tide of June, July, August and September, this scheme was further modified in 1829 by the proposed addition of two pair of Gates to each of the openings, thereby converting the Flood-Gates into navigable Locks. In proposing *these schemes*, the free admission of water from the Hoogly into the Canal, proposed by the projectors, was only limited by the height of the water, which would injure the Drainage of the City of Calcutta. As the Lock is at present constructed half the width of that of the original plan, and therefore admitting little more than half the quantity of water intended when the construction of the salt works were commenced upon—there cannot, I presume, be the slightest grounds of complaint against the management of the Chitpore Locks by me.

3rd. The second observation on which I am called upon to remark is contained in the same paragraph, and is "The fall of water at the Lock-Gates, a rapid like that of the old London Bridge," the Military Board are aware that a daily register is kept of the fall and velocity of current through the Lock at Chitpore, by a reference to which it appears, that the greatest fall which has occurred this year was two inches, and the most rapid current 4 miles an hour. The fall through the old London Bridge sometimes exceeded $4\frac{1}{2}$ feet, with a current of 12 or 15 miles an hour, the comparison between these two cases cannot be drawn with propriety—and [the] conclusion, that the Lock-Gates have been to "serve" as an *impediment and danger*, instead of a convenience, is equally inapplicable.

4th. The third subject of complaint which is contained in the 7th paragraph, is the injuries which the fisheries in the Lake may sustain by the admission of fresh water. No facts being adduced in support of this conjecture, the question rests on the natural history of fish, on which subject I do not consider myself competent to give an opinion, but one fact may be mentioned which bears on this enquiry, viz., that the Lakes are filled with fresh water during the rains,—the fisheries are worth about 4,000 Rupees a year.

5th. In the Postscript, 3 Boats, besides many others are stated to have been sunk, during the few days of mischief "created by me." I shall not consider this charge as personal, but to have been made in the hurry of writing, or in ignorance of my duties as Superintendent of these Canals. The removal of obstructions from the Balliaghatta Canal, which are the cause of the sinking of Boats in it, is not in my power, but is the duty of the Magistrate—every thing in my power has been done, notice has been given, and repeated Letters written to the Magistrate, but no attention whatever has been given to my requests. Having repeatedly brought this subject to the notice of the Military Board, no blame will, I hope, be attached to me for having exceeded or fallen short of the duties imposed on me.

Mr. G. Prinsep's Letter is herewith returned.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 172 to No. 182 inclusive, omitted.)

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No. 183.

No. 416.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. P. GOWAN,

Officiating Secretary, Military Board.

Canals.

SIR,

Barrackpore: 30th May, 1834.

With reference to your Letter No. 251, of the 13th instant, relative to the Drains of the Road along the Circular Canal, I beg to enclose copies of two Letters from Captain J.

Thomson, Nos. 14 and 20, of the 20th and 28th instant, from which it will be seen, that it was never intended to lead the water from the Bank across the Roadway and then back again under the Road. The Drains A and B being continued as Surface Drains along the sides of the Road, until an opportunity offers for carrying off the water from the first to the westward, or into one of the long Town Drains.

With reference to Board's No. 251, of the 13th, relative to the Drains of the Road along the Circular Canal, forwards copies of Captain Thomson's Letters Nos. 14 and 20, of the 20th and 28th instant, by which it will be seen, that it was never intended to lead the water from the Bank across the Roadway and then back again under the Road, and states, that the mode adopted by that Officer for Draining the Banks is the best and simplest that could be followed.

2nd. I lately inspected the Circular Canal, accompanied by Captain Thomson, and conceive that the mode adopted by that Officer for Draining the Banks is the best and simplest that could be followed with reference to the unservicable state of so many of the original Pucka Drains, and to the expence that would be incurred in repairing and enlarging them to a proper size.

3rd. Captain Thomson, in his Report of the Circular Canal last year, having stated as his opinion, that a pucka Road along the East Bank was not required, is now levelling that Bank with a slope from the crest across the whole breadth of 70 feet, as shown on the Sketch in the accompanying Letter No. 14, and suggested that should a breadth of 50 feet be considered sufficient for the Road and Tow-path, the remaining 20 feet be rented. The total area of ground that might thus be disposed of, and extending between the Boitakhanah and Dum-Dum Bridges, he calculates at 14,000 feet long and 20 feet broad, or equivalent to about 19 Beegahs, but as this probably could not be again resumed if required without considerable expence and difficulty, it should not be hastily relinquished for the profits it may hold out.

I have, &c.,

(Signed) R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 183. a.

No. 14.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 20th May, 1834.

In reply to your Letter No. 218, of the 16th instant, I forward to you a section of the Canal Banks as they are now being formed.

The Drain A, is continued as a Surface Drain along the side of the Road, until a favorable opening is found to carry the water off westward, or into the long Town Drain by means of a well with a grating. The Drain B, is formed on exactly the same principle,

but in all instances except one, it is carried into the Town Drains. The Drain C, on the east side of the Canals, is conducted in the same manner as the Drain A, but as there are no pukka Drains entering the Canal on that side, an opening eastward, to carry the water in that direction, is made through the Bank of earth whenever it may appear necessary or convenient:—to have made Mr. Prinsep's Drain sufficiently large to have been cleaned out, would have cost more than two Lacks of Rupees.

I have, &c.,
(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 184.

No. 20.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta: 28th May, 1834.

SIR,

I have the honor to forward herewith, section of the Drains of the Road on the west Bank of the Circular Canal, taken from the measurement of two of them.

I estimated the expence of constructing these Drains sufficiently large to permit a man to go into and clean them, at six times their original cost, proposing that they should have two and a half times greater interior dimensions, or having six times more masonry in them.

2nd. On reference to Appendix D. to Mr. Prinsep's last Report on the Circular [Canals,] 48 Cross-Drains and one small Bridge, are stated to have cost about 7,000 Rupees. In my Letter No. 14, I mistook the number of cubic feet of masonry for the price: the above-mentioned Cross-Drains are on an average 350 feet apart. The state of these Drains are as follows: about half of them are in the same state as they were built, a number of them however became liable to be choaked generally at the upper grating, and the water either overflowed and cut into ravines the Canal Bank, or the Bank settled into large holes or slid according to circumstances: the Road also became softened and gave way in large hollows, which soon became impassable, some of the Drains became closed at the lower end and burst out through the slope of the Bank, in others the water passed down outside of the brickwork, permitting the Road and Bank to settle in holes: some of these evils might have been avoided by keeping some one to attend to the cleaning of the Drains, and repairing any injury that might occur, but they could not all be thus remedied.

3rd. I have not made use of any of those small Drains, and have effectually closed up those that have been injurious to the Banks, as I consider them wrong in principle and contrary to the usual practice.

I have, &c.,
(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copies.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

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No. 185.

No. 424.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. P. GOWAN,

Officiating Secretary, Military Board.

Barrackpore: 31st May, 1834.

Canals.

SIR,

Agreeably to the concluding paragraph of your Letter No. 109, of the 6th, I

With reference to the concluding paragraph of Board's No. 109, of the 6th, transmits Reports of the Committee, dated 23rd instant, on points connected with the improvement of the Canal Department, as adverted to in Capt. Young's, No. 2201, of 10th September last.

have now the honour to transmit, for the consideration of the Military Board, the accompanying Report of a Committee consisting of Captains W. R. Fitzgerald and J. Thomson, of Engineers, and a separate one from Mr. James Prinsep, both dated the 23rd instant, on points connected with the improvement of the Canal Department, as adverted

to in your predecessor's Letter No. 2201, of the 10th September last, to their joint address.

2nd. In further explanation of Captain Thomson's views, regarding the proposed Cess-pools, I beg to refer the Board to the 9th paragraph of his Report, No. 1, forwarded with my Letter No. 423, of this day's date.

3rd. The Chitpore Lock-Gates, having been allowed to remain open so short a period, no decided opinion can be formed at present, I fear, as to the effect of scouring the Circular Canal by admitting a current from the Hoogly, but I am of opinion with Mr. Prinsep, that the strength of current necessary to carry off the Drain deposit, could not fail to be injurious to the Banks of the Canal.

I have the honour to be,

Sir,

Your obedient Servant,

R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 185. a.

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 23rd May, 1834.

SIR,

In compliance with the orders received in your Letter No. 240, of the 17th instant, the undersigned have the honour to Report their opinion on certain points connected with the Circular and Balliaghatta Canals, specified in the Military Board's Letter, No. 2201, of the 10th September, 1833.

2. In reply to the first question the Committee are of opinion, that Cess-pools, at the end of the Calcutta Drains near the Circular Canal, would undoubtedly prevent, in a great measure, filth and sediment being carried by the Drains into the Canal; but the economy, expediency, or even practicability of constructing them, will depend entirely on the level of the water of the Town Drains, and that of the high and low-water in the Circular Canal, of

which levels the Committee have no defined knowledge. In reply to the first observation in the 2nd paragraph of the Military Board's Letter, the Committee are of opinion, that the bottom of the Cess-pool should be about the level of the low water in the Circular Canal, in order that it might be laid dry and dug out at any time during low water. The expence of digging out the deposit from the Cess-pool would be about 1-7th of the expence of dredging an equal quantity from the bottom of the Circular Canal. The filth might be removed from the Cess-pool by either land or water carriage, according to circumstances. The opinion of the Committee in reply to the 4th paragraph on the best manner of preserving the Circular Canal, free from the sediment brought into it from the Town Drains, coincides with the opinion given in all former Reports on this subject, that a current of water be admitted from the River Hoogly through the Canal for this purpose, and if after a fair trial any further measures are necessary they may be then considered.

3. The Committee in reply to the second question contained in the first paragraph, are of opinion, that if in any part of the Canal the sliding of the Bank arises from the softened state of the lower part of the Bank on a level with the water, being unable to sustain the weight of the upper part, by the removal of that weight or pressure, leaving a berme or step on a level with the water, the sliding of the Bank will be prevented,—and they are further of opinion, that if the Banks are properly drained and cut to a slope, leaving a base not less than twice the higher, [² height,] that they will slide from the first mentioned cause only. With regard to the preservation of the Banks generally the Committee have to observe, that if after the Banks have been properly drained, the slope made not greater than the proportion above-mentioned, and the manner of fixing the Boats to the Banks properly regulated, any sliding which may take place should be remedied by making or leaving a step at the foot of the slope, or by encreasing the base of the slope in proportion to the height according to the situation and soil.

We have the honour to be,

Sir,

Your most obedient Servants,

W. R. FITZGERALD, *Captain, Engineers.*

J. THOMSON, *Superintendent, Engineers.*

No. 185. a.⁽¹⁾

As I differ in some respects from the opinion of my colleagues on the subjects referred for our consideration, I beg leave to record my sentiments separately.

1. Coss-pools of sufficient dimensions to create any deposition of the sediment of the Town Drains in its rapid passage during the rainy season to the Canal, I should think it impossible, or at any rate very difficult to construct, they must necessarily be very large and expensive reservoirs, in passing through which the current of each Drain should lose a considerable portion of its velocity. The deposit from each Drain annually being, say 50,000 cubic feet, would, alone require a Chamber $50 \times 100 \times 10$ feet. I however of course agree that Cess-pools would, if they existed, save the Canal from the present inconvenience—and I agree with Captains Fitzgerald and Thomson on the proper depth to be given to them.

2. I do not consider that a current from the Hoogly through the Canal would effectually prevent the Drain deposit. It would spread the evil throughout the line towards the Lake, and certainly carry off a portion, but unless the River water were admitted with such force as would be dangerous to the Canal Banks I hardly think it would have a scouring effect.

3. I have not observed any disposition in the Banks of the Circular Canal to slide, excepting at places where tanks had existed prior to the excavation of the Canal, which were filled in with the earth of excavation. The slope therefore of two-thirds, (30 feet base to 20 feet height) would seem to be sufficient to preserve the Banks from sliding. I should not think therefore that there is any necessity for a berm, or step as proposed by Captain Thomson. The Drainage of the Banks was provided for by water-courses leading generally through the Bank to the Canal, and I did not remark, while I was in charge, any difficulty on this score. A small establishment to clear the Drains and repair incipient damages is all that is requisite.

J. PRINSEP.

23rd May, 1834.

(No. 186 and No. 188 a. inclusive, omitted.)

No. 188. b.

No. 24.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 10th June, 1834.

With reference to your Letter No. 422, I have the honor to report as follows on the Balliaghatta Canal:—

2nd. The width of the space now occupied by the Balliaghatta Canal Banks and Roads is 150 feet; in a few places it is a few feet more, but in no place it is less. The effect of the current of water admitted from the Hooghly River, has had as yet no other effect, generally speaking, than to injure the south Bank; and no other effect can be anticipated until the manner of fastening the Boats in the Canal is properly regulated; and until I receive authority to do so, any report on the probable effects of a current through this Canal must rest on conjecture.

3rd. I shall state in a general manner the object I am desirous of attaining, leaving the details and cost to be ascertained when the work is approved of. The surface of the water of the Balliaghatta Canal is proposed to be 70 feet wide, (it generally exceeds this at present). The breadth of the Road on each side is proposed to be not less than 20 feet, with a Drain including slopes five feet wide; these will amount to $70 \times 25 \times 25 = 120$ feet, leaving 30 feet for the two slopes of the Banks. These slopes are proposed to be made with a base of 2 to 1 of height, which will give 8 feet as the greatest height of the Bank. The height of the Bank near the Salt Water Lake is at present about 3 feet 9 inches, and the rest of the Bank varies from that to 14 feet. It is therefore proposed to make the height of the Banks at the junction of the Circular Canal 8 feet, and to slope it gradually towards the Lake where it will be made 4 feet high, leaving the Roads at the east end 27 feet wide; as the width of the Canal to the west of the junction of the Circular Canal is of little importance, the height of the Bank at the Koolya Bridge will not be altered, but the slope will be increased in the proportion above-mentioned.

4th. It will be impracticable at once to make the Road of the breadth proposed, and the Bank with the slope of 2 to 1; because the Bank would have to be built of loose earth in some places, 15 feet into the water of the Canal: as it now is, this loose earth would probably be washed away in a few days; it is therefore intended to remove the earth that is superfluous to the proposed section, and not to attempt to add any new Bank or Slopes until

there is formed by the process of silting, a foundation on which to raise it, as has been the case on the north side of the Canal.

5th. I wish particularly to observe, that the cutting down and sloping of the Banks of this Canal is necessary for the preservation of them, and only connected with the digging out or deepening of the Canal, in as far as it is necessary, previous to commencing the latter work.

6th If it is intended that this work be done during the season 1834-35, to prevent disappointment, I should receive authority to remove a proportion of the Boats from the Canal and commence the work on the 1st of September next. I could then commence the digging out of the Canal, if [it] is ordered on the 15th November, the only season that the work could be done with economy. When the excavation of the Canal was completed the earth taken out could be carried into the Salt Water Lake, to form the Tow-paths there, at the only season they could be formed, viz. from the 1st February to the 15th March.

I have, &c ,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copies) R TICKELL,
Superintending Engineer, Lower Provinces.

(No. 189 and No. 190 inclusive, omitted.)

No. 191.

No 57

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO CAPTAIN E P GOWAN,
Secretary to the Military Board.

SIR

Calcutta : 18th July, 1834.

In reply to the Superintending Engineer's Letter No. 953, and with reference to the Military Board's Letter No 1272, I have the honor to forward 5 sections of the Balliaghatta Canal, having the section proposed marked on them in red ink, accompanying them is a revised

* No 191 b Revised Estimate by the Superintendent of Canals, of the probable expence of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same Section as the Circular Canal, viz 72 feet wide at Zero and 30 feet at bottom, with a depth of 7 feet, and the Banks above water with a slope of 2 to 1, amounting, after correction, to Sicca Rupees 6,800 14 (See Board's Proceedings, 6th May and 4th July last)

Estimate* of the expence.

2. In measuring the sections (sent herewith) in-accuracies in the plans and reports of the ground belonging to this Canal were detected. The original breadth of ground said to have been purchased for this Canal was 150 feet, marked by the dotted lines aa, aa, but it appears by a reference to the Field Books of the Survey to have varied from 155 to 170 feet, marked by the letters b, b b, b In consequence of this additional breadth of Bank, the necessity of cutting down the Banks to the extent recommended in my Letter No. 24, of the 10th June, is avoided, and a revised Estimate is sent accordingly.

I have the honor to be,

Sir,

Your most obediant Servant,
J THOMSON, Captain,
Superintendent of Canals.

(No. 192 to No. 210 inclusive, omitted.)

No. 211.

No. 2662

FROM THE MILITARY BOARD

TO THE HONORABLE SIR C. T. METCALFE, BART.,

*Vice President in Council**Fort William 23rd September, 1834.*

Department of Public Works

HONORABLE SIR,

Recommending Captain Thomson's Bill for excavating the bed of the Circular Canal, with remarks.

With reference to the 4th paragraph of our Letter No. 3,479, dated the 3rd December 1833, in which we stated our having authorized the excavation of the bed of the Circular Canal, we have now the honor to submit for the sanction of your Honor in Council, the undermentioned Bill, and to recommend that it be passed

Bill (No. 65, Book H. of 1834-35, M. B. O.) by Captain J. Thomson, Superintendent of Canals, for expence incurred in cleaning and excavating the bed of the Circular Canal, amounting to Sicca Rupees 4,745 : 5 : 3.

2nd The amount authorized by us for this work and intimated to Government, was 1,975 Rupees, there is therefore an excess of Rupees 2,950 . 5 3 Captain Thomson has annexed to his Bill an explanation regarding this excess, which in so far as it shows the indispensable necessity for the extra work may be considered satisfactory. It was however the duty of Captain Thomson to have informed the Board, when he found that his Estimated outlay was likely to be so much exceeded. The rates however are moderate

3rd. The majority of the Board remark, that the amount of the above charge is satisfactory, in so far as that it was Estimated by Colonel Wood's Committee, that the annual expence of clearing out the deposit of the Calcutta Drains into the Circular Canal, by manual Dredging, would come up to the large sum of Rupees 15,000. It appears that the deposit of two years has been removed at the expence stated in the above Bill.

4th Lieutenant Colonel Galloway dissents entirely from the above paragraph. He remarks, that the work herein comprised embraces but a small portion of the deposit from the Calcutta Drains falling into the Circular Canal. The effects of the Calcutta Drains, as specified by Colonel Wood's Committee, were ascertained by actual soundings by Mr James Prinsep. The Dhurumtollah Drain alone is stated to have produced a deposit of 400,000 cubic feet per annum, and this Drain does not run into the Circular Canal, and consequently was not cleaned out by Captain Thomson on this occasion. Again, the scour by the admission of the water through the Lock, as expressly foretold by Colonel Wood's Committee, has had the effect (and it is all the effect it can have) of moving these shoals (of deposit) into "that portion of the Canals adjoining the Circular Canal." The deposit is therefore *moved in*, not *removed from*, the Canal by Captain Thomson's labor. He does not pretend that this has been effected. On the contrary, Captain Thomson, in his Annual Report dated the 10th May, particularly observes, that part of the Canal to the eastward of the Circular branch, has been "filled up this last year with filth from the Dhurumtollah Drain. But this Drain is in addition to those which fall into the Circular Canal, and from it there be 400,000 cubic feet of silt to extract, what must be the amount of the whole which at one point or other must be deposited? Captain Thomson's words are as follows: "The Ballisore Canal is nearly in the same state it was in last year."

“The numerous obstructions then reported *were removed; but have again accumulated* : “*about 300 yards of the west end of the Canal is filled up by filth from the Dhurrumtollah Drain.*” “The great width of the Canal at the east end, which by reducing the “strength of the current, causes a silting up, perceptible since last year. This deposit has “taken place at the sides of the Canal, the centre has probably deepened. I cannot give the “precise depth, as some one has removed the Gauge.” It would be strange indeed if Colonel Wood, Major Irvine, Captain Forbes, and Mr. James Prinsep, should have reported an accumulation of deposit to the extent of 883,000 cubic feet, besides that the Dhurrumtollah Drain requiring an annual outlay of 15,000 Rupees to clear it, and yet that the said accumulation, not for one, but for two years, besides original soil, should have been all extracted by Captain Thomson for 4,745 Rupees, and Captain Thomson himself not to know this or decline mentioning it.

5th. The majority of the Board beg leave to refer to Captain Thomson’s Letter No. 102, dated the 15th instant, and observe that they think it more reasonable to correct an Estimate by the results of actual experiment, than to invert these operations as Colonel Galloway has done. It appears that the accumulation of mud in the Circular Canal has been at the rate of 382,050 cubic feet per annum, which may be removed at an expence of Rupees 2,350. The deposit from the Dhurrumtollah Drain into the Balliaghatta Canal, estimated by Mr. J. Prinsep at 400,000 cubic feet per annum, is not included in the present Bill; *neither was it included* in Colonel Wood’s Committee’s Estimate of 883,000 cubic feet, and Rupees 15,000, which referred to the Circular Canal only.

6th. The majority of the Board further remark, that it is only necessary to read Captain Thomson’s 10th paragraph to see that it is the *western* end of the Balliaghatta Canal, which Captain Thomson says has filled up, on which the Circular Canal current could have had a very slight effect. In regard to the eastern end through which the Circular Canal current did flow, Captain Thomson says, “the centre has probably deepened,” and “a perceptible silting up since last year” has taken place “at the *sides*,” owing “to the great width of the Canal” at that end.

7th. That much of the Circular Canal deposit could have been carried into and left in the Balliaghatta Canal is wholly improbable: the bed of the Circular Canal was lower than that of the Balliaghatta, and was moreover intersected by Bunds; and lastly, the Balliaghatta or Eastern Entally Canal being narrower than the Circular Canal, must have had a stronger current, the effect of which would be to carry the silt into the Lake Channel, or still deeper tideways beyond. The injury to the Barrackpore Bridge has not yet been shown to arise from currents.

8th. Lieutenant Colonel Galloway observes on the above paragraph, that the omission of 400,000 feet of deposit by the Durrumtollah Drain would not diminish, but increase the cost; and that this fact, which is known, would render the operations of Captain Thomson not more probable but still the more marvellous. The moving of silt from one place to another however, is not extracting it, and therefore the operations of Captain Thomson, in cleaning out one particular spot at a small rate, no more show the cost of keeping clear this line of Canal from the deposit of the Calcutta Drains than the amount of any given Bill by Captain Thomson would show the cost of work executed by another. Lieutenant Colonel Galloway knows that the strong current admitted into the Circular Canal has moved the mud therein deposited by the Drains, but the consequence of this has been that the Banks of the Canal and the Bridges have been injured, and it has been thus demonstrated, that no such currents can again be admitted; and consequently, that no such clearing can again be produced—and he leaves it to be judged whether it is not paying too much for clearing the Circular Canal to do so at the risk of such demolition. Lieutenant Colonel Galloway refers to Captain Thomson’s Report on the Barrackpore Bridge, the masonry

abutments under which, for Towing-paths, have sunk from the current having carried away to some depth the foundation soil between the Piers.

9th. Lieutenant Colonel Galloway remarks, that he has inserted the quotations from Captain Thomson's Report, and he believes they will prove beyond dispute, that part of this line of Canals was silted up with silt, which could have come from no other source than the Calcutta Drains, which nevertheless, the majority of this Board maintain, "was (and that for two years) removed by Captain Thomson, at the expence stated in this Bill."

10th. It is added, that "no injury to the Bridges has yet been experienced." It is sufficient to refer to Captain Thomson's Report on the Barrackpore Bridge to show that injury has been sustained.

We have the honor to be,

Hon'ble Sir,

Your most obedient Servants,

A. GALLOWAY, *Lieut.-Colonel, Member Military Board.*

D. McFARLAN, *Chief Magistrate, Member Military Board.*

G. YOUNG, *Capt., Officiating Member Military Board.*

(No. 212 omitted.)

No. 212. a.

*Extract—Letter from J. Prinsep, Esq., dated 15th March 1834, to
Superintending Engineer, Lower Provinces.*

Lock-Gates.

15. In my former Reports I stated, that the Gates would be swung by the 1st March : they were not, however, suspended until the following month, and the coppersing of the last pair of Gates was not completed at the time of the storm in May. By caulking the outer pair of Gates, however, (as reported in my Letter of the — May 1833,) an easy means was obtained of laying the Lock Chamber dry, and finishing the work, so that the whole was ready by 20th June. The outer River Bund was then cut away, and I passed through the Lock passage for the first time on the 21st June.

16. The Gates continued in use for three months, and were found to work well in every respect. They were left open for a few tides during the 26th and 27th of July, without any ill consequence. During the height of the rains, when the low-water of the River was higher than the ordinary level of the Canal, the River Gates were necessarily always kept closed, but Boats were locked through without impediment or difficulty.

17. On the 28th September, during an experiment to ascertain the effects of allowing the River water to run freely through the Canal for a whole spring-tide, an accident, or rather inadvertence in the Overseer, caused the fracture of the inner pair of large Gates, as reported in my Letter of the 8th October. The removal of the broken Gates kept the Lock passage closed entirely for only three days; after which the daily transit of Boats, by means of the small Gates, was uninterrupted until the end of November, when the large Gates were once more placed in an efficient state. I should remark, that the broken Gates were removed, repaired, and re-placed, without taking the water out of the Chamber. The expence incurred by their accident has been kept separate in the accounts, and will be seen to amount to Rs. 1,200 : 9 : 84.

18. When the excavations were going on in front of the Lock towards the River, it occurred to me as very advisable to secure the foundation of the Lock masonry by buttresses

and a sunken face-wall, in a curved direction across the Canal, 25 feet in advance of the foundations of the Lock itself, so as to occupy the place of, and save the necessity of driving piles for their protection. This support to the River front was rendered more complete by terracing the space between the floor of the Chamber, the Steps, and the sunken wall, (as will be seen in the accompanying plan and elevation,) so as to allow the water to run freely over it, without any cascading or cutting action. The good effect of this has been manifest, and I could recommend a similar protection to the curved walls on the Canal side, should it be contemplated to allow the River water free ingress even occasionally: for (as reported on the 8th October, 1833) the force of one day's strong current cut away the bed of the Canal to a depth of 3 feet close to the masonry, and excavated a hole 8 feet in depth below the bed, at a short distance further on the Bank of the Canal. As long as the passage is only used for Locking Boats through, there is no necessity for any such measure.

19. The number of Boats capable of passing the Lock in a day, assuming that three on an average enter the Chamber together, and that ten minutes are consumed in their passage, may be estimated at upwards of 200. The register of six months appended to the present Report shows the average to have been nearly 50 daily. The Gates were never worked during the night. It must not be supposed that more Boats would pass if the passage were left entirely open: on the contrary, experience has shown that, on account of the velocity of current through the contracted Channel, few Boats venture to pass, even a short time after the turn of tide either way; and from the inequality in the hours of the tide in the River and in the Canal, added to the circumstance of the mean level of the Canal being midway, between high and low-water of the River, during the greater part of the year it happens that the slack water in the Lock Chamber is only of momentary duration, and the turn of the current very sudden and rapid. This requires some care in the manœuvring of the double system of Gates; but no inconvenience has hitherto been felt therefrom: the establishment of 12 Classees and 3 Divers, recommended in my letter to your address of the 12th August, 1833, being found ample under the superintendence of Mr. Bedford, the European Overseer, to work and look after them.

20. The Estimate I made of the probable velocity of stream and slope of surface under different conditions of the Canal and River, (see my Letter on the 6th June, 1831) has proved faulty in some respects. I assumed a constant height of reservoir and a continual flow of water; and then calculated by the usual formula what would be the velocity, supply, and slope, in the Canal and in the Lock passage respectively; such a state of things, however, does not occur, since the rise of the River continues while the stream is flowing: and before a sufficient supply of water has entered the Canal to produce a regimen, or equilibrated condition for any given height of the feeding reservoir, a new condition ensues, and the fall through the contracted passage is much greater than was contemplated: thus, with a difference of level between the River and the Lake of one and a quarter feet, I calculated that there would be a fall of 13 inches through the Lock, and a velocity of four and a half miles per hour, whereas in the experiment of the 27th September, the difference of level out and inside the Lock near the steps, was six feet, and in the passage alone 40 inches, while the velocity was estimated by the Overseer at $7\frac{1}{2}$ miles per hour.

21. Of the details of the construction of the Lock, I have little to add to what was stated in my former Report.

22. The masonry was bound together by a stone coping; each stone firmly united to the next with iron cramps: and the curved walls towards the River having shown symptoms of weakness, when the earth was filled in behind them, were further secured with an iron band bolted round them at the half height of the wall, and put on hot, so as to bind firmly as it cooled. It was thought at first that planking round the Wing Walls as well as in the Chamber would be necessary to secure the masonry from injury by the shocks and contact

of Boats, but experience has shown, that little damage need be anticipated on this score, and any such planking would be speedily destroyed by the boring-worm unless covered with copper. This has been the case already with the wooden planks and wedges bolted down on the stone sills of the floor against which the Gates close; but the latter can be re-placed without much difficulty when found to be unserviceable.

23. The Gates themselves were coppered all over, with the exception of part of the back of the inner large Gates, to protect them from the worm. It has been satisfactory to find that the copper of the rounded post wears much less than I expected by friction against the stone groove, although the Gates fit very closely against the stone when the pressure of water is considerable.

24. It was found unnecessary to apply rollers to the foot of the Gates to relieve the collars in opening and shutting them: the small Gates were nearly buoyed up in the water, and the large ones were perfectly balanced in deep water by their lever beams. The chain windlasses and levers were sufficient for manœuvring these Gates; but some little inconvenience was experienced in closing the small Gates from the impossibility of applying levers. I had at first intended to fix iron bars connected with the chain and windlass, so as to have a pushing as well as a pulling action, and thus serve to shut them: the oblique counterforts seen in the plan of the masonry, were intended to support the Tunnels in which these bars were to work, but I was induced to give up the design because of the difficulty of supporting such a length of bar, and of getting at the Tunnel to repair it in case of any thing getting clogged, or out of order in the apparatus; while any impediment might cause serious injury during the rapid change of current. I therefore determined on having every thing of the simplest construction, and all in sight and within reach: and I fitted on cross ropes and tackle to pull the small Gates open from the opposite sides of the Lock. The only inconvenience of this system was, that the ropes remained hanging slack across the Chamber while the Boats were passing. This however was rather an advantage to small Boats, as they were enabled to pull themselves through by the ropes; while the latter were unshipped in a moment, if necessary, for larger Craft or Boats with high masts.* The wear and tear of

Captain Thomson has since successfully applied the chain and rod movement to both pair of small Gates.—J. P. tackle will not, I conceive, be so expensive as any apparatus of a more complicated nature.

25. The manipulation of the iron Sluce Shutters, by means of a screw and nut, was found to be simple and easy, and the counterbalance weight to be unnecessary. The four-handled levers to work them are too near the ground, and may be advantageously raised so as to be worked by the hand without stooping.

26. I have terraced over the whole of the artificial earth included within the Wing Walls of the Lock from stairs to stairs, so as to prevent the rain water from penetrating to the back of the masonry. This point should be attended to, and in case of the ground subsiding at all below the level of the stone coping it should be filled up at once, and re-terraced until the earth has required sufficient solidity to resist the action of water settling on its surface.

27. Of the Bridge over the Lock erected by Captain Fitzgerald and Captain Thomson, I need say nothing more than that it stands upon foundations altogether distinct from the Lock, and may therefore be retained, if at any time it should be deemed advisable, to throw open the Canal in the style of Tolley's Nala. The total expenditure upon the Lock-Gates, including 1,200 Rs. for the damage done in September, has been in 1832-33, Rs. 39,702 : 8 : 9½, or, with last year's Bill, Rs. 61,098 : 7 : 11, being about two-thirds of the amount estimated for a double Lock.

29. I shall offer no comments upon the success or utility of the work, nor on the schemes connected with the Eastern Canals, which I understand to be now in contemplation. The department is now in the hands of an Officer whose scientific knowledge and experience are eminently adapted to do justice to the grand objects contemplated by the Right Hon'ble

List of Boats Passed by Circular Canal.

J. PRINSEP,
Late Superintendent of Canals.

No. 212. a.⁽²⁾*Extract from Lock Register kept by Mr. J. Bedford.*

Month.	Date.	Morning or Evening.	Hour.		Moon's Age.	High or Low-water.	Lock Gauges 100 feet apart.				River Gates.	Canal Gates.	Time of water passing 100 feet.	Velocity of current per hour.				
							River side.		Canal side.									
1833.			h.	m.			ft.	in.	ft.	in.			2ds.	m.	f.	ft.		
July.	26	Morning.	10	34	9	H. W.	12	10	12	8	Open.	Open.	18	3	1	160	Slope 2 inches.	
"	...	Evening.	6	14	...	L. W.	6	6	6	6½	Ditto.	Ditto.	34	2	0	25	Ditto ½ ditto.	
"	27	Morning.	11	24	10	H. W.	12	10	12	8	Ditto.	Ditto.	18	3	1	160	Ditto 2 ditto.	
Sept.	27	Evening.	1	20	...	H. W.	15	10	12	6	Ditto.	Ditto.	9	7	0	3040	{ (Gates carried away) slope 40 inches.	
Nov.	26	Ditto.	1	30	...	H. W.	11	0	11	0	Ditto.	Ditto.	34	2	0	25		Ditto 0?
"	27	Ditto.	2	0	...	H. W.	11	5	11	5	Ditto.	Ditto.	34	2	0	25		Ditto ditto.
"	28	Ditto.	2	30	...	H. W.	12	0	12	0	Ditto.	Ditto.	34	2	0	25		Ditto ditto.
"	29	Ditto.	2	40	...	H. W.	2	9	7	4	Ditto.	Ditto.	34	2	0	25	{ Mistake in this entry.	
Dec.	4	Ditto.	3	20	...	L. W.	3	5	3	5	Ditto.	Ditto.	34	2	0	25		{ Slope not perceptible in 100 feet by the gauge.
"	5	Morning.	9	15	24	H. W.	9	1	9	1	Ditto.	Ditto.	36	1	0	2720		
"	...	Evening.	4	15	...	L. W.	3	5	3	5	Ditto.	Ditto.	34	2	0	25		
"	6	Morning.	10	30	25	H. W.	9	2	9	2	Ditto.	Ditto.	36	1	0	4720		
"	...	Evening.	6	0	...	L. W.	3	5	3	5	Ditto.	Ditto.	36	1	0	4720		
"	7	Morning.	10	0	26	H. W.	8	9	8	9	Ditto.	Ditto.	40	1	0	3720		
"	19	Evening.	3	30	...	L. W.	2	7	2	7	Ditto.	Ditto.	50	1	0	1920		

CALCUTTA:

8th April, 1834.

J. PRINSEP,

Late Superintendent Canals.

(No. 213 to No. 215 inclusive, omitted.)

No. 215. a.

No. 1.

EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

To COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

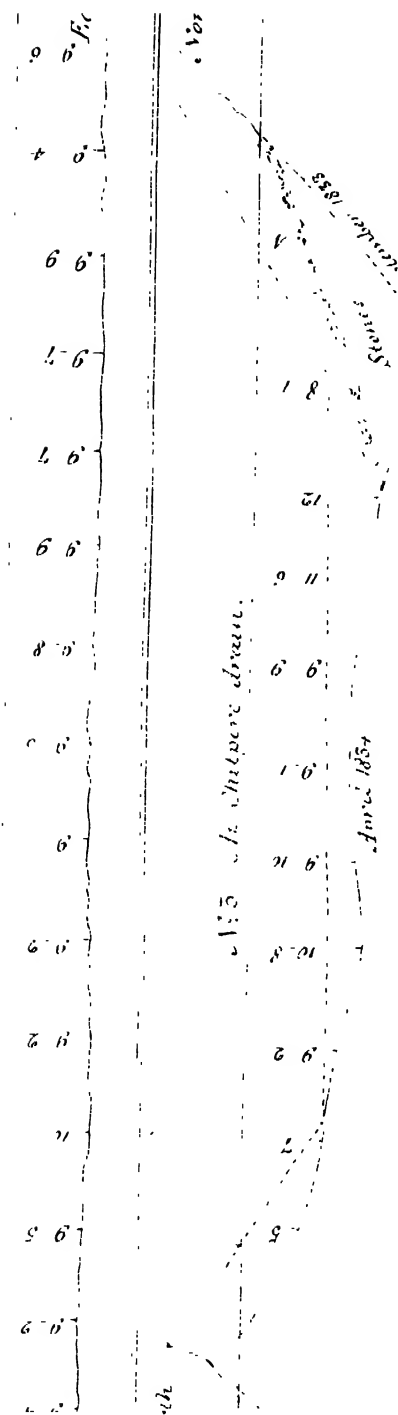
Calcutta: 10th May, 1834.

" The line of Canals forming the navigation between the Hoogly and Ishamuttee Rivers being completed, an annual Report of progress may be deemed superfluous: in this Report, therefore, I shall confine my remarks to the present state of the works, and to the best means of preserving and improving them.

" 2. Since I received charge of the Chitpore Locks in October last year, the Log-Dams were put in at each end, and the water between them pumped out. It required three days to put down one Log-Dam: as the Dam is required in cases of emergency, it would be desirable to be able to put it in its place in three or four hours, which might be done with a

the Canals Scale 20 feet to 1 Inch.

Level of



one way in which this matter (of so much interest to me) could be arranged, and I hope to be pardoned for mentioning it. If the Military Board or Board of Conservancy, would draw up short instructions or directions for the management of the Drains beyond the Town Boundary, the Magistrate would no doubt carry them into effect, his Overseer Mr. Dyson, being an intelligent and active man; the directions above-mentioned might receive the sanction of Government, if considered necessary. As the case now stands, the Drains are in the same state as last year, and the same consequences will necessarily follow; and, as it may not be convenient to stop the navigation of the Canal next January, for the purpose of digging out the sediment brought in by the Drains, I have to represent the necessity of having a Dredging Boat ready to deepen the shallows where most needful.

" 9. In digging out the Circular Canal, I did not observe any light-coloured sandy sediment, such as might have been expected to have been deposited from the waters of the Hoogly River. The mud in the bottom of the Canal was, from its appearance, derived from the Banks which had slid, or been washed in by the rain before they had consolidated or become covered with vegetation. Two-thirds of the mud opposite the mouths of the Drains consisted of mould, arising from the sides and bottoms of the Drains, one-fourth was composed of very *soluble* black mud-formed vegetable and animal decomposition. The quantity of *soorkee* washed from the Roads into the Drains, and from thence into the Canal, was much less than I expected: it was scarcely perceptible. The causes of the deposition of sediment from these Drains are so varied, that a perfect remedy cannot be proposed to meet every circumstance; but I am still more strongly of opinion than I was last year, that Cess-pools offer the greatest advantages. I am supported in this opinion by observing, that Mr. Kyd, in his original proposal for the formation of the Circular Canal, considered Cess-pools at the termination of each Town Drain as not only essentially necessary for keeping the Canal navigable, but as a source of profit by disposal of the manure collected in them. No estimate or efficient plan for Cess-pools, however, can be formed until the opposing interests and different opinions, of what ought to be the proper slopes and levels of the Drains, are adjusted. It is no doubt the interest of the Conservancy Department to have as great a slope for the Town Drains as possible, as the increased current caused thereby will sweep away the filth and save them the expence of removing it. This saving to the Conservancy Department is a sixfold expence to the Canal Department, and of course to Government, who pay for both; because the same current that brings the filth from the City of Calcutta, brings at the same time three times as much soil and mud from the bottoms and sides of the Drains. The whole of which has to be dredged or dug from under 7 feet of water; without entering into any detail or calculation of what the slope of the Drains ought to be, so as to allow of the cheapest removal of the filth from the City of Calcutta, the Board of Conservancy would perhaps have no objection to have the slope reduced to what it was before the excavation of the Circular Canal, or to reduce it to 3 feet 9 inches per mile, which experience has shown to be amply sufficient. The slope which theory points out as the best, is 2 feet 6 inches per mile.

" 10. The Balliaghatta Canal is nearly in the same state as it was last year. The numerous obstructions then reported were removed, but have again accumulated. I have to report the following changes: about 300 yards of the West end of the Canal is filled up by filth from the Dhurumtollah Drain; about 600 yards of the South Banks has fallen in, to a greater or less extent; Section No. 5 shows the usual appearance of it at present; Section No. 6 is that of 200 yards of the worst place; about 800 yards of the North Bank at the East end has, under the orders of the Magistrate, been cut very steep and injured, with a mistaken intention of improving the Road; the South Bank has also been cut by a private individual in a slighter degree. These injuries can be repaired at a small expence, and are only mentioned as increasing an evil which ought to be remedied; viz., the great width of the Canal

at East end, which, by reducing the strength of current, causes a silting up perceptible since last year; this deposit has taken place at the sides of the Canal, the centre has probably deepened. I cannot give the precise depth, as some one has removed my Tide Guage opposite Mr. Prinsep's Salt Works, to which I referred my levels. Three other Tide Guages have been removed from various places, by which the trouble and expence of taking a series of soundings for months have been lost, and I cannot resume this work again until I can devise some permanent mark as a standard to which I can refer the levels. The deepening of the mouth of the Balliaghatta Canal may be attributed to several causes—the persevering removal of sunk Boats from the head of the Lake Channel, the admission of water from the Hoogly by the Chitpore Locks, during 30 days of the years 1833-34, but more particularly the unprecedented low tides in the Lake Channel in November, December, and part of January last. *The rise* of the tide at Balliaghatta has been reported, and is generally believed to be about 10 inches; observation, however shows, that in the months above-mentioned, the rise and fall is 3 feet 3 inches spring-tides, and 1 foot 9 inches neap-tides. The low-water in the Lake Channel being 3 feet, 4 feet, and 5 feet below that in the Canal, causes a strong scour at the mouth of the latter, but with only a partial effect; as at that time, the water in the Canal was only 8 inches deep and 20 feet wide. If the Chitpore Lock had been available at that season, great benefit would have arisen by the admission of the River water.*

* This is an important fact, with reference to the Drainage of Calcutta.—J. M.

“11. The navigation from the Hoogly through the Circular Canal to the Sunderbunds, being entirely independent of the Sunderbund line of Canals, I shall take the liberty of bringing to your notice such parts of the *original scheme as have not been carried into effect*, and the alterations which have been proposed from time to time, which still appear necessary to the completion of the design.

“12. Embankments or Tow-paths on both sides of the Lake Channel formed part of the original scheme for this navigation; they were sanctioned by Government, and partly executed in 1825 by Major Schalach, the death of that Officer and the comparative failure of the attempt to dredge the Lake Channel, from which source the earth for the Embankment was to be procured, appear to be the reason that this work was not carried on to completion. The original purpose of the Embankments was to confine the water to the Channel, but from the two years' Dredging, or some other cause, the Channel has so much improved since 1825 as not to require Embankments for the above-mentioned purpose, as a current runs in a SE. direction nearly twice as long as in NW.; a tracking path on one side is requisite for the import trade during a part of the year—and from the strong Southerly winds during another part of the year, a tracking path is required for the export traffic—and if there is to be only one path, experience shows that it must be on the South-west side, in consequence of the strong Southerly winds. In connection with these Tow-paths is the proposal which has met with the approval of the Military Board, but the Estimate for which has not yet been sanctioned, viz. to convert the NE. division of the Lake into a reservoir to scour out the head of the Lake Channel, and consequently the mouth of the Balliaghatta Canal, and to deepen the entrance into the Docks at Balliaghatta. This latter work has been estimated at 800 Rupees. The Tow-path on the SW. Bank of the Channel, 8,500 yards in length, may cost about 3,000 Rupees, with the Bank two feet six inches high, as first proposed; but, as it is intended that the water should pass over the Tow-path, one foot high would probably be sufficient, and 1,500 Rupees the cost. If the Southerly wind did not make it obligatory to form the Tow-path on the SW. Bank, that Bank is preferable to the NE. Bank, because the outlet of South-west division of the Lake being the Byah Nullah: there are very few Nullahs running into the Lake Channel through the SW. Bank. This Bank is lower by three or four inches than the other, which will make the first cost a little more, but the expence of keeping it up will not be so great.

" 13. The next work I have to mention which has been frequently recommended by Captain T. Prinsep, is that of giving the Banks of the Balliaghatta Canal a greater slope. This work was partly authorized and executed at the West end of the Balliaghatta Canal: but not carried the whole length, as it would reduce the breadth of the Roads so much. This objection might be avoided by diminishing the height of the Banks at the same time that the slope was increased, which would have the further beneficial effect of preventing the sliding of the Banks by their great weight. This work has been estimated at 3,390 Rupees. If the sliding and falling in of the Banks only rendered the Roads impassable, it would be of little importance; but the earth fills up the Canal which cannot be cleared out again, except at a very great expence, compared with the prevention of the evil.

" 15. I have collected much information on the tides in the Sunderbund Canals, which I shall defer reporting on until November next, when one year's series will have been completed. The removal of several of my Tide Guages has induced me to defer taking soundings of the depth for the present; and as I did not receive from the Military Board the plans and sections of these Canals until after my return from visiting them, I have not been able to make such a satisfactory report on the changes that have taken place in them, that I could have wished.

" 16. For the purpose of making the Tow-paths, authorized by the Military Board's Letter, 8th May 1833, I hired in the month of November 1833, twenty-two Coolies, who have completed the Tow-path from Baminghatta to Bongerhot, nearly finished the work at Chytul, and will commence at Hoossainabad immediately. These Tow-paths, as far as they have been made, are a greater accommodation to those navigating the Canals than I last year supposed they would be. They have been all made along the South Bank, as the Boats can only be tracked from that side during the SE. monsoon, when the greatest traffic is passing through the Canals—during the past year, the greater part of the ground from Hoossainabad to Hinshee Khaul has become occupied, the jungle cut, and Embankments formed. I have taken advantage of those Embankments for tracking paths, and directed the jungle between them and the Nullahs to be cut at a height of three feet from the ground; but, as it is the interest of the proprietors to encourage the growth of the jungle between their Embankments and the water, I expect that the work will be put a stop to very soon. The right of Government to a tracking path along navigable watercourses is a subject of the greatest importance, not only to those Canals but to the inland navigation of Bengal, two-thirds of which is carried on by tracking. I have to request instructions for my guidance on this point.

" 17. Section No. 7 is a section across the Baminghatta Canal, it is given as an example of the slopes that the Banks of a Canal assume when excavated in the black clay, which forms the greater part of the soil of the Sunderbund, and will form an excellent guide in making Canals or Drains through a similar soil.

" 18. No change appears to have taken place since last year in the Baminghatta, Bhojediggy, Goonamagie or Chultabarya Canals, except that Bunds have been made across the Dood-beebie Khaul, to the Northward of the Goonamagie Canal. There were Dams across this Khaul before the Canals were executed, but they were removed by Captain Prinsep for the purpose of getting a greater scour through the Chultabarya Canal, the intended effect does not appear to have been produced, so that the closing this Khaul is a matter of no importance.

" 19. The Bhowanypore, Baley-Gunge and Hoossainabad Canals appear to have widened a little during the past season, particularly the last mentioned. The Chytul Canal has not changed in any respect. The three first mentioned Canals are much more frequented by Boats of every size than the Canals to the Westward; although the Bhowanypore Canal is very shallow, yet they prefer it to the large Channels connected with the Roymungul, which

may be considered as impassable at this season of the year. The Salt Darogahs at Hoossainabad mentioned, that 5 or 600 Boats passed through these Canals daily, sometimes 1,000. I supposed from my own observation, that there were about 300 Boats or 150,000 maunds per diem.

" 20. The Bhowanypore Canal was dug two or three times, but is at present the shallowest in the whole line; this arises, as you are aware, from the sandy nature of the soil, and not from the stillness of the water, a strong current runs through it, which would be greater if the Canal was deeper and of more uniform width. If it is intended to keep the navigation of these Canals open, it will be necessary to excavate this Canal again, and to repair the Bank. This would be a business of much difficulty, but not impossible. The Bank would have to be built up with fascines and a puddle wall behind them, to prevent the sand oozing through. I have not taken measurements sufficiently accurate to enable me to make an estimate of this work; and, as the quantity of water passing through this Canal is increasing, the work may not be required for some years. I have given two sections of this Canal, No. 8 is taken where the bed of sand about 2 feet thick, between the black upper soil and yellow clay sub-soil, has been washed out: Section No. 9 is at that part of the Bank formed entirely of fine sand, to repair which appears nearly hopeless. The oozing of the sand through the Banks of this Canal, caused by the water lying on the ground at the back of each of the Banks, appears to have been increased by the Nullahs, which usually allow this water to drain off, having been dammed up by the people connected with the salt manufacture. There are fewer of these Nullahs dammed up this year than last year. I shall endeavour to prevent these dams being made in future.

" 21. I have to request permission to keep up the gang of Coolies next season to cut jungle, repair and increase the length of the Tow-paths, and remove sunken Boats and trees. The cost will be 1,500 Rupees during the year, including Boat hire, rope, tools, and other contingencies: a bill for the expences of the past year will be sent in when the work is concluded in the month of June.

" 22. I shall take this opportunity of correcting a mistake in my last year's Report, respecting the proper time that Boats should leave Hoossainabad, to proceed Westward by the Canals. The best time is about quarter to half flood-tide, because they will have the flood-tide up the Gobra Khaul pass through the Bhowanypore Canal at high-water, and go down the Hinshee Khaul with the ebb."

(No. 216 to No. 223 inclusive, omitted.)

No. 224.

No. 141.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 19th November, 1834.

The Estimate for digging out the Balliaghatta Canal having been authorized by the Board's Letter 2199, dated 26th August, I have the honor to request instructions respecting the disposal of the earth that will be carried into the Salt Water Lake. I proposed in para. 12th of my Letter No. 1, dated 10th May last, to form Embankments and Tow-paths on the Lake Channel with it, but these have not yet been authorized. When the Estimate for

these Tow-paths was sent, my experience of the depth of the water in the Salt Water Lake was formed from the observation of two rainy seasons, in which comparatively very little rain fell. The experience of the past season however, has induced me to recur to my former Estimate of 3,000 Rupees for Embankments, two feet six inches high.

2nd. With reference to this subject Mr. G. A. Prinsep has made a proposal, that if the Embankments is made in the manner proposed by me, so as to cut off all communication between the Lake Channel and his salt works, he will not consider that his interests will be injured by admitting the Hoogly River water at the Chitpore Locks.

I have the honor to be, &c ,

(Signed) J THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces

(No. 225 to No. 227 inclusive, omitted.)

*No. 228.

No 130

EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

To COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces

Calcutta. 30th October, 1834

"At the conclusion of the rains I have the honor to Report, that the quantity of sediment brought into the Circular Canal this season, is more than twice as much as the yearly average. The quantity deposited by the Narculdanga Drain is 213,000 cubic feet, and by the other Drains in proportion. The least depth of water at Narculdanga is one foot 8 inches, Manicktollah 2 feet 6 inches, Nundun Bagan Drain 2 feet 2 inches. These depths are measured from the zero of Captain Prinsep's Gauge. I have not yet received authority for commencing the construction of Mud Boats for the Dredging Boat, so that I cannot deepen the Canal with it before the month of March, supposing I received the authority now. The height of the River Hooghly is at present 7 feet above the average level; and I cannot expect that I shall be able to open the Lock-Gates before the end of November, by this latter means I may succeed in deepening the Canal about 2 feet, but as the Salt Water Lake falls a foot below the zero in the cold season, there will remain only 2 feet 6 inches water in the Canal, which will prevent loaded Boats passing through it."

No. 229 omitted.)



Sections of the bottom of the Circular Canal taken near the Narvuldanga Bridge
at the following times

1 December 1833	Canal dug out to this depth
15 March 1834	26 Inches of rain had fallen up to this time
1 July	
31 October	
28 th November	

The Lock Gates had been open 10 days

Scale for distance 500 feet to 1 Inch

(Sig^d J. Thomson Capt^l.)
Sup^t of Canal

No. 230.

No. 142.

EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

To COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 28th November, 1834.

" I have the honor to reply to the questions stated in your Letter No. 2120, of the 26th instant, as follows:—

" 2nd. The annual average quantity of sediment from each of the Calcutta Drains is about 90,000 cubic feet: this was ascertained by the quantity dug out of the Entallee Canal, and what was dredged and dug out of the Circular Canal. Colonel Wood's Committee, on Mr. James Prinsep's information, assumed the above quantity, and reported it to the Military Board, with reasons for their opinion (I have not a copy of their Report): my experience has not induced me to make any alteration in this assumed fact.

" 3rd. The quantity of sediment deposited this year by the Narculdanga Drain has been ascertained by several soundings taken before and after the rains. The calculation of the quantity of deposit from the soundings was corrected, by the observations made when the Canal was dug out last February.

" 4th. The quantity of rain that fell from 1st of June to the 31st of October of this year, was, by the Register in the Asiatic Society's Journal, 61 inches, and during the same season of last year, 25½ inches fell: my opinion is, that eight or nine inches per month is the average quantity that falls during the rainy season."

No. 231.

No. 2287.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

To CAPTAIN E. P. GOWAN.

Officiating Secretary Military Board.

Barrackpore: 9th December, 1834.

Canals.

SIR,

I have the honor to forward the enclosed sketch received from Captain J.

Forwards Captain J. Thomson's Sketch of the effect of the Narculdangah Drains on the depth of the Circular Canal, &c.

Thomson, Superintendent of Canals, of the effect of the Narculdangah Drains on the depth of the Circular Canal for the past year, being a continuation of that Officer's Report No. 130, of the 30th October last, (a copy of which was transmitted with my No. 1851, dated the 3rd ultimo) and showing the effect of opening the Lock-Gates, which has increased the depth at the Narculdangah Bridge two feet, as was anticipated.

(True Copies.)

E. P. GOWAN,

Officiating Secretary Military Board.

No. 232.

No. 4370.

FROM THE MILITARY BOARD,

TO HIS EXCELLENCY THE RIGHT HONORABLE

LORD WILLIAM C. BENTINCK, G.C.B.,

Governor General of India in Council.

Fort William: 6th January, 1835.

MY LORD,

In continuation of our Letter No. 2,662, of the 23rd September last, we have the

Reporting the quantity of sediment brought into the Circular Canal during the rains of 1834.

*No. 1851, of the 3rd November 1834, from Colonel Tickell, with enclosure.
No. 2204, of the 3rd ultimo, from Colonel Tickell, with enclosure.
No. 2287, of the 9th ultimo, from Colonel Tickell, with sketch.

honor to submit for the consideration of your Lordship in Council, the documents noted in the margin,* on the subject of the sediments brought into the Circular Canal this year by the Calcutta Drains, by which it appears that the average quantity brought down by each of the eight Drains falling into that Canal is 90,000 cubic feet, or in all 720,000 cubic feet. The measurement given by Lieutenant Colonel Wood's

Committee, of which Major Irvine and Captain Forbes were Members, gave the quantity at 883,000 feet.

2nd. The accompanying Chart shows the extent of silting opposite one of the Drains, and the effect of the scour of 10 days in dispersing it by opening the Lock in October last.

3rd. The majority of Board remark, that Captain Thomson's statement of the actual quantity of sediment cleared out at the time the Canal was laid dry, would not warrant the expectation of so large an influx this year. It must be difficult to estimate the solid contents of heaps or mounds of mud under water.

We have the honor to be,

My Lord,

Your Lordship's most obedient humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer, Member Military Board.*

A. GALLOWAY, *Officiating Member Military Board.*

D. McFARLAN, *Officiating Member Military Board.*

G. YOUNG, *Captain, Officiating Member Military Board.*

(No. 233 to No. 236 inclusive, omitted.)

No. 237

No. 84.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN E. P. GOWAN,

Secretary to the Military Board.

Calcutta: 20th August, 1834.

SIR,

I have the honor to acknowledge the receipt of Letter No. 1904, with the instructions of the Board regarding the objects contemplated by the Circular Canal and its preservation, and to state the plan of operations recommended for carrying these objects into effect with economy and regard to private interests. With the exception of the first proposal, the "maintenance of the requisite depth of water at all times," which can only be

partially effected by the following rule, all the others will be attained by admitting the water from the River at all times that the high-water in the Hoogley does not exceed the high-water in the Lake by 5 feet. The diagram accompanying this Letter will show the times that the Gates would be opened according to this rule, viz., when the high-water in the Hoogley marked by the blue lines are below the red line, which marks the 5 feet above high-water in the Lake. It appears by this diagram, that after the first springs in December until the second springs in March, the larger Lock Gates may be thrown open and fastened back in their recesses : from the 1st August till the first of November they will have to be closed entirely, because although the high-water neap-tides is below the red line, yet the low-water neap-tides do not on all occasions fall below those of the Lake, in which case there would be a constant current from the River to the Lake which would not permit the Gates to be closed until low-water spring-tides, unless the Log-Dam was put down ; during the rest of the year, from the second springs in March till the first of August, and from 1st of November till the first spring in December, the Gates would have to be closed occasionally during spring-tides.

2. This rule only holds good during the present obstructed state of the Balliaghatta Canal, when that Canal is cleared of Boats, &c., so as to be navigable, the red line in the diagram will probably have to be lowered 6 or 9 inches.

3. I may further observe, that observations during the past year has shown, that during the months of January and February, and occasionally at other seasons, the tides at Bhamin-ghatta fall below the tides in the Hoogley River, and consequently the water in the Balliaghatta Canal is retained at its present height only by the shallowness of it and the head of the Lake Channel, if therefore the Canal and Lake Channel were deepened the water would run off more freely and be shallower than it now is. The following instance will prove this. In Captain Prinsep's time, the Balliaghatta Canal had an average depth of 3 feet 4 inches, the fall of the tide at Koolya Bridge 10 inches, and at Chingreeghatta 1 foot 8 inches. At present the average depth of the Canal [is] 5 feet 3 inches, the fall at Koolya Bridge 2 feet, and at Chingreeghatta 3 feet 9 inches or 4 feet. In stating that by digging the Canal deeper it would be proportionally shallower, it will be understood that the level of the surface of the water will be lowered at low-water, and the Circular Canal and other parts of the Canal not excavated, will be shallower at that time, but where the Canal is dug out there will be the same depth of water as at present. To increase the depth of water in this Canal is fortunately easily accomplished by damming up the Nullahs running into the North side of the Lake Channel, as already proposed and Estimated for : by this work the outlet of the north-east part of the Lake will be so contracted, that the water would not fall more than 1 foot during low-water, it would therefore preserve about 2 feet more water in the Canal.

4. To preserve the depth of water in the Basin between the Locks and the River, the smaller Gates should be opened on the 1st February for a fortnight or three weeks to scour it out.

5. It is a question for the Board to decide whether the smaller Gates might not be fastened back at the times the larger Gates were : and the Establishment at the Locks dismissed for three or three and a half months, with the exception of the Tindal, two Classics and a Diver, who, as acquainted with the management of the Lock, must be retained, but might be employed on other work. The consequence of opening the smaller Gates during three or four months would be, that the Balliaghatta Canal and the East end of the Circular Canal would be reduced in depth about 6 inches, and the West end of the Circular Canal would fall $3\frac{1}{2}$ or 4 feet, although heavy laden Boats could not navigate with $3\frac{1}{2}$ or 3 feet, yet there would be no more delay to the navigation than if the water was retained in the Canal by closing the Gates, because that part of the Channel between the Gates and the River has now only 1 or 2 feet at low-water. The flux and re-flux in the Canal would

cause a double scour, and be convenient to the navigation, but would bring so much salt water into the Canal that it would not be drinkable East from Manicktollah Bridge during low-water.

6. The only other object to be considered is the preservation of the depth of the Canal opposite the mouths of the Calcutta Drains, the most economical method of doing this (not already considered) is by the Steam Dredging Boat, which works at one-sixth the cost of the hand-dredging Boats, and would be much cheaper than by digging out by hand-labour if the interest of individuals residing on the Banks and the loss of tolls were considered. The loss of tolls and inconvenience to the public by closing the Circular Canal every year, is undoubtedly under the present Regulations of no importance, but the comparison made above, is in expectation of an improvement in this respect speedily taking place—I allude to the Customs Regulations and not to the Judicial or Fiscal. In this statement I have not mentioned the current and slopes of the water in the Circular Canal, as I could not put them in an intelligible or useful form. The constantly changing current caused by the variable rate at which the tide rises is modified by waves, or alternate rising and subsiding of the water three or four times during each tide. The average rate of current corresponding to a tide of any particular height might be ascertained by using one of Massey's Patent Logs, this information would be of no use towards the preservation of the Banks, as it is the greatest current that does the injury and not the average rate. The remarks refer principally to the currents through the Lock, those in the Circular Canal depend greatly on the obstructions that may happen to be in the Balliaghatta Canal: a large sunk Boat in this latter Canal will reduce the current half in the former Canal.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 238.

MY DEAR GOWAN,

I can only put my explanation in other words as follows:—

The low-water at Bhaminghatta is on a level with the bottom of the Circular Canal, and one foot three inches below the bottom of the Balliaghatta Canal, and the only reason that the whole of the water does not run out of these Canals at low-water is the obstruction to its so doing by the shallowness of the head of the Lake Channel and of the Balliaghatta Canal: if these shallows are deepened more water will run out of the Canal at low-water, and consequently the Canals will be shallower. For example, at Chingreeghatta at low-water spring-tides in December, there is one foot water: if the Canal was deepened as intended, one foot three inches, there would only be one foot water, and the surface of the water would be lowered one foot three inches.

This fall of the tide at Chingreeghatta of 15 inches will cause a fall in the Circular Canal, at the Barrackpore Bridge, of about four inches, and at the junction of the two Canals of nine inches.

Your's truly,

J. THOMSON.

(No. 239 to No. 249 inclusive, omitted.)

No. 250.

No. 150.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta : 23rd December, 1834.

SIR,

Having commenced the repairs of the Sunderbund Canal Tow-paths, I have the honor to request instructions respecting the cutting jungle between the Embankments of land and the navigable Channels in the Sunderbund, referred to in paragraph 16th of my Letter to you, No. 1, of the 1st of May last.

2. I repaired last year the Banks of the Sunderbund Canals, but they have been again cut to allow the water to run off the land and to catch fish. I have complained to the Magistrate of the 24-Purgunnahs at the time that the offence was committed, but no effectual remedy has been applied. I will therefore not repair these Cuts this year, because when again cut a larger portion of soil will be carried into the Canal than if they are permitted to remain in their present state.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 251 to No. 254 inclusive, omitted.)

No. 254½.

No. 5539.

FROM THE MILITARY BOARD,

TO HIS EXCELLENCY THE RIGHT HONORABLE
LORD W. C. BENTINCK, G.C.B.,
Governor General of India in Council.

Fort William : 3rd March, 1835.

MY LORD,

We have the honor herewith to submit for the consideration of your Lordship in Council, the undermentioned Estimates, and to recommend that they be sanctioned.

Recommending two estimates by Captain J. Thomson, for excavating the Ballaghatta Canal and making Tow-paths in the Salt Water Lake.

Estimate (No. 290, Book B. of 1834-35, Military Board Office) by Captain Thomson, Superintendent of Canals, of the probable expence of making Tow-paths on the Salt Water Lake, amounting to Sicca Rupees 3,275 : 0 : 0.

Estimate (No. 291, same Book and Office,) by the same Officer, of the probable expence of excavating the Balliaghatta Canal, from the junction of the Circular Canal to the Salt Water Lake, to the same section as the Circular Canal, viz., 72 feet wide at zero, 30 feet deep, and reducing the height of the Banks, and making them to a slope of 2 to 1, amounting to Sicca Rupees 5,000 : 0 : 0.

2. The excavation of the Balliaghatta Canal, and reducing the height of its Banks and the formation with the excavated earth of a Tow-path in the Salt Water Lake, have since May last been recommended by the Superintendent of Canals and the Superintending Engineer, Lower Provinces, as measures absolutely necessary for the free navigation of that Canal; but unwillingness to increase the expence already incurred on these Canals, and the apprehension of destroying confidence in the holders of ground on their Banks, by closing them for a further period so soon succeeding the shutting up of the Circular Canal, induced us to postpone the work.

3. The estimate now submitted is for deepening the Balliaghatta Canal by means of the Steam Dredger, which it is stated will not involve the necessity of closing the Canal, and which besides being the most appropriate work for the Dredger, (determined to be kept up) reduces the probable cost considerably below the former estimate, which was Rupees 10,226 : 6 : 0.*

4. The construction of Tow-paths on the Salt Water Lake has been considered desirable, not only as affording the best means of disposing of the earth that must be dug from the Balliaghatta Canal, but as affording the means of towing Boats and preserving a sufficient depth of water at the head of the Lake Channel and entrance into the Balliaghatta Docks.

5. In his Letter No. 177, of the 17th March, 1834, to the address of Colonel Tickell, Captain Thomson observes, that "the principal difficulty to be met with in this work (digging out the Balliaghatta Canal) is the disposal of the earth that is to be dug out. If piled up in a wet state on the high and steep Bank, the whole would certainly fall in; and to buy tanks or hire ground on which to place it, together with the carriage, would considerably exceed the present estimate:" he goes on—"independent of the proposed measure for deepening the Balliaghatta Canal, I continue of opinion that the Banks should be cut down for the purpose of preserving them and getting an increased width of Road.

6. On the same subject, this Officer observes in his Letter No. 141, of the 19th November last, to the address of Colonel Tickell—"Mr. G. A. Prinsep has made a proposal, that if the Embankment is made in the manner proposed by me, so as to cut off all communication between the Lake Channel and his salt works, he will not consider that his interests will be injured by admitting the Hoogly River water at the Chitpore Locks."

7. Under the above circumstances, and the rates of earth-work, considering its nature being moderate, we have no hesitation in recommending that the above estimates be sanctioned.

8. An advance of Sicca Rupees 5,000 for clearing the Balliaghatta Canal is required by Captain Thomson, by an assignment on the Collector of the 24-Pergunnahs.

We have the honor to be,

My Lord,

Your Lordship's most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer, Member Military Board.*

A. GALLOWAY, *Officiating Member Military Board.*

D. McFARLAN, *Officiating Member Military Board.*

G. YOUNG, *Captain, Officiating Member Military Board.*

* Proceedings
6th May 1831.

No. 254½. a.

CANAL DEPARTMENT.

Estimate No. 7.

Estimate of the probable expence of making Tow-paths on the Salt Water Lake, called for in Military Board's Letter, No. 4033, of the 19th December 1834.

Description.—The Tow-paths to be Embankments of the undermentioned section—at such parts of the Bank of the Lake Channel as are not dry at low-water, a row of guran stakes, 18 inches apart, will be driven in, and brush-wood put in between them so as to prevent the earth being washed away by the rising tide during the construction of the Embankment. The Nullahs will be dammed up in a similar manner.

Section of Tow-paths.

According to the details given in estimate No. 4, dated 9th December 1833, the work in 1000 yards of Embankments will be—

22,342 cubic feet of embanking below water.

111,960 ditto ditto above water.

400 running feet of staking with brush-wood.

Estimate of the expence of Embanking 1,000 running yards.

111,960 cubic feet of embanking above water, (@ 3 Annas per 100 cubic feet,	209	14	10
22,342 ditto ditto below water, @ 8 Annas per 100 feet,	111	11	6
400 running feet of staking, @ 16 Rupees per 100 feet,	64	0	0
	<hr/>		
	385	10	4

Rate.

Or about 13 Rupees per 100 running feet.

Abstract.

Embanking East side of the Channel from Balliaghatta to No. 2 Chowkee,			
6000 feet, @ 13 per 100,	780	0	0
Ditto West side of the Channel from Chingreeghatta to Bya Nullah, 9,500 feet, @ 13 per 100,	1,235	0	0
Ditto from Bya Nullah to Baminghatta, not including the larger Nullah, 18,000 feet, @ 7,	1,260	0	0
	<hr/>		
Total Sicca Rupees,	3,275	0	0

CALCUTTA,
SUPERINTENDENT CANAL OFFICE :
24th December, 1834.

J. THOMSON, *Captain,*
Superintendent of Canals.

* This Document was sent to Government but not returned—Calculations only examined.

No. 254½. b.

CANAL DEPARTMENT.

Estimate No. 8.

Estimate of the probable expence of excavating the Balliaghatta Canal, from the junction of the Circular Canal to the Salt Water Lake, to the same section as the Circular Canal, viz. 72 feet wide above, 30 feet wide at bottom, 7 feet deep, and reducing the height of the Banks and making them to a slope of 2 to 1, authorized by the Military Board's Letter, No. 2199, dated 26th August 1834. See my Letter No. 77, of the 7th August 1834, my estimate No. 15, of the 17th March 1834, and my Letter No. 57, of the 18th July 1834.

Excavating 1125 Chowkas of mud, or eleven weeks' Dredging, @ 250 Rupees			
per week, including establishment and Repairs,	2,750	0	0
Contingencies consequent on the carriage of the mud to the Salt Water Lake,	250	0	0
Repairing the Roads and Drains, cutting down the Banks, and forming the slopes			
and carrying about 1,000 Chowkas of earth into the Salt Water Lake, ..	2,000	0	0
Total Sicca Rupees,	5,000	0	0

CALCUTTA,
SUPERINTENDENT CANAL OFFICE :
24th December, 1834.

J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 255 to No. 277 inclusive, omitted.)

No. 278.

No. 170.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta : 23rd April, 1835.

SIR,

With reference to your Letter No. 3407, enclosing the Military Board's Letter No. 6496, [of the 14th instant.] I have the honor to bring to your notice, that two cases to the point in question were put in my Letter No. 161, of the 18th March, viz., " my right or otherwise to cut the jungle on the Banks of the Sunderbund Canals to permit tracking along them, and the extent of my authority to prevent any one making Cuts through the Banks of the Canals or Channels.

2. By the 2nd paragraph of the Military Board's Letter, the right of the public to the use of the Banks of navigable Channels for the purpose of tracking is allowed ; but in the 3rd paragraph, existing private interests are made an exception. The justice of the case appears to me to be however, that the right of tracking being inherent in the public, no grant to an individual can interfere with that right, unless particularly specified in his grant

by Government. I hope to be excused mentioning an example. The Magna Charta of England directed the removal of all mill-dams, fishing weirs, and every obstruction whatever from all navigable waters in England, without any remuneration to the parties whose property they were. The original right of the public is thus shown. Also by Regulation VIII. of 1824, the Bengal Government gave considerable powers to the Supervisor of the navigation of the Nuddea Rivers to remove trees and other obstructions on the Banks of the Rivers that might interfere with the navigation.

3. If the Bengal Government do not, by a Regulation or other Act, declare the right of the public to the use of the Banks of navigable Rivers, but allow the proprietor of the land a remuneration for the use of his land in any single instance, tracking will be put a stop to entirely; there is now more than 7-8ths of Banks of Rivers free and open, but they would all be closed if any particular case was to be considered on its own merits, as proposed by the Military Board; as no negotiation could be entered into with an individual except on the principle of paying for any damage done.

4. In the artificial Canals, a tracking path must of course be paid for, but no one possessing the land on the Banks can, with any justice, make Cuts so as to drain his land into the Canal, as is now the custom.

I have, &c.,

(Signed) J. THOMSON, *Captain,*

Superintendent of Canals

(True Copy.)

R. TICKELL,

Superintending Engineer, Lower Provinces

(No. 279 to No. 287 inclusive, omitted.)

No. 288.

Extract of a Letter No. 17, dated the 1st August 1835, from CAPTAIN JOHN THOMSON, Superintendent of Canals, to COLONEL R. TICKELL, C. B., Superintending Engineer, Lower Provinces.

"2. In taking soundings in the Canals, I am happy to observe that the current which was admitted to run through the Canal when the Paddle Sluices were under repair in May and part of June, has almost entirely swept out the sediment from both the Circular and Balliaghatta Canals, more particularly the latter; in the former not much impression has been made on the deposit opposite the mouths of the Nundeen Beghan and Narculdanga Drains. The current admitted into the Canal was, no doubt, stronger than it would have been advisable to allow if the necessity of keeping the Gates open had not existed, but it has only injured the Bank of that part of the Canal which is improperly obstructed with Boats, so that if sufficient authority was granted for regulating these, the mud could be scoured out and a very great saving in dredging might be made, perhaps three-fourths of the annual Estimate, or 4,000 Rupees. I do not, of course, anticipate that the Lock Gates will be closed another year, on account of the salt works at Balliaghatta."

(True Extract.)

E. SANDERS,

Secretary Military Board.

(No. 289 and No. 290 omitted.)

No. 291. a.

A.

*Extract from a Dispatch from the Hon'ble the Court of Directors,
No. 4, dated the 14th May 1834, in the Revenue Department.*

"Para. 6. The Jellinghee and Bhagaruttee Rivers appear to be becoming progressively more and more difficult of navigation, and to require a great and increasing expence for keeping them open. We wish you to consider whether by bestowing on the Bhagaruttee alone the whole of the attention and labour now bestowed on both Rivers, a more effective navigation might not be secured. We trust however, that the new Canal through the Sunderbuns will answer the expectations that have been formed respecting it, and render the navigation of the Jellinghee and Bhagaruttee a matter of less importance than it has hitherto been. The operations on the Mattalhangha have our approbation."

[Paras.] 31 to 41, also Letter dated 21st December, 1830. Paras. 46 to 59. Ditto, 16th August, 1831. Paras. 11 to 14. Ditto, 24th July, 1832. Paras. 17 to 19. Nuddea Rivers and Dredging Boats.

No. 291. b.

B.

Extract from a Resolution from the Hon'ble the Governor General of India in Council, in the Revenue Department, passed on the 6th April, 1835.

"2. The Proceedings reported in paras. 43 to 50 of the same Dispatch, will also have explained the reasons which influenced Colonel McLeod and Captain Forbes in preferring the Jellinghee River to either the Bhagaruttee or Mattabhangha, as best calculated to secure a free communication between the Ganges and the Hooghly, in the absence of means for affording a permanently navigable Channel between these two Rivers, and until the practicability of the scheme suggested by these officers of cutting a still-water Canal from Rajmehal on the Ganges to Mirzapore on the Hooghly shall have been determined upon, after the completion of the Survey now in progress, it will be unadvisable to resume the operations heretofore carried on for the purpose of improving the Channel of any of the three streams above-mentioned, especially now that the establishments under Mr. May have been broken up, and his own services directed to other quarters.

"3. With respect to the new Canal through the Sunderbuns, it is to be lamented that the Reports of Captain Jenkins and of Mr. James Prinsep are unfavourable to its success. These Reports have been already brought to the notice of the Hon'ble Court in reporting the Canal operations of 1830-31 and 1831-32; a separate Report on this particular Canal has been promised in the present Superintendent's letter, dated the 10th May last, to Colonel Tickell's address, and the attention of the Military Board will now be called to the subject, in order to ascertain how far the Canal has answered the purposes for which it was executed."

Miscellaneous Revenue Consultation, 29th September 1834. No. 6, Para. 15.

(No. 292 to No. 294 inclusive, omitted.)

No. 295.

No. 36.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 17th October, 1835.

SIR,

I have the honor to Report for your information, the quantity of mud in the Circular Canal at the close of the rains, and previous to opening the Gates.

Drains opposite to which the mud is deposited.						Quantity of mud. Cubic feet.	Least depth of water Below Zero.
Balliaghutta	Drains,	..	..	..	..	3,200	6 4
Sealda	ditto,	..	..	..	..	16,000	6 0
Narculdanga	ditto,	..	..	..	..	175,000	1 8
Manicktullah	ditto,	..	..	..	..	50,000	3 2
Nurdun Baghan	ditto,	..	..	..	..	63,000	3 1
Ultadanga	ditto,	..	..	..	..	3,400	6 4
Baghbazar	ditto,	..	..	..	..	3,400	6 2
						314,000	

(True Copy.)

E. SANDERS,

Secretary Military Board

(No. 296 to No. 319 inclusive, omitted.)

No. 320.

Extract—Copy of a Memo. given to D. McFARLAN, Esq., Chief Magistrate, by Captain JOHN THOMSON, after perusing Military Board's Report on the Circular Canal.

“ Para. 28. The inconveniencies and obstructions in Tolly's Nullah and the Canals are now so great, that the removal of these obstructions or making another Canal, the Tolls might be doubled or quadrupled without reducing the Toll on the others a single Rupee.

“ The money extorted from the people, the loss and damage of Boats and goods, and the payment for the hire of Boats and men, while they are delayed, amount in my opinion, to about one lac a year at least, and experience has shown, that the removal of a vexatious exaction of say 1,000 Rupees, would increase the traffic so as to give a return of 2, 3, or 4,000 Rs.

“ With respect to the last paragraph on the Town Drains, the bottoms of the Town Drains at the Circular Road are pukka, and have never been altered, the slopes beyond them (in two or three instances out of the seven) have been increased; but the delivery of these

Drains cannot now be more than one-fifth or one-sixth more than formerly, and there being 5 feet difference between the levels of some of them, no water now runs out of one : but is carried round about 3 miles (or more) to get out at another, so that I have seen the Narkuldanga Drain running nearly full a week after the rains had ceased. I have mentioned repeatedly in my Letters that the source of all the soil that is carried into the Circular Canal arises from the suburbs beyond the Circular Road. There are exceptions, 4-5ths or more of the Dhurumtollah mud comes from the Town, and half at least of the Nundun Baghaun Drain.

“Neither opening the Gates nor the Dredging Vessel can prevent the Circular Canal being closed for part of August, September and part of October.

“My complaints about the Customs Chowkies and the arrangement of the levels of the Town Drains have been decided on by the Board, but they nevertheless still exist, and the Government should know of their existence, otherwise they have reason to say they have been deceived.

“You will understand my meaning, although not very carefully worded.”

(Signed) J. T.

(No. 321 to No. 325 inclusive, omitted.)

No. 325½. a.

Extract—Letter from Captain J. THOMSON, Superintendent of Canals, to Colonel R. TICKELL, C. B., Superintending Engineer, Lower Provinces, dated 1st April, 1835.

“The removal of the earth deposited in the Canal by the Town Drains has not been authorized, nor any measures adopted for the prevention of the serious evil, I beg to observe that the expence of cleaning out the Canal is increased three-fold by deferring the repairs from year to year, instead of making them immediately they are required. The first year's deposit retards the current in the Canal, and the next year's deposit is thereby greatly increased, at the same time the Tolls are reduced, as the best paying Boats (those that are loaded) cannot pass.

“6. Tolly's Nullah being in a worse state than usual this year, (as before observed) was closed at all times except four or five days each spring-tide, and in consequence of the bad arrangement of Boats it requires usually ten or fourteen days to get through; it must therefore occupy at present two or three tides (spring) to pass, or from a month to six weeks. The number of Boats going through the Circular Canal has, for the six weeks, more than doubled the former average, and on one occasion amounted to 125 Boats in the day. The tide not having been admitted by the Locks to remove the deposit from the Drains or to raise the surface of the Canal, only two feet nine inches water was the depth in the shallowest place at Nurculdanga Bridge, and I suppose two-thirds of the trade were excluded in consequence.

“7. The Entallee Canal is entirely filled up for 200 yards at the West end, and there

Entallee Canal to the is a large accumulation of mud in the remaining part of it, and the Koolya Bridge.

Banks have slipped in several places. Reports of these circumstances have been made and estimates for repairs forwarded (3,381 Sicca Rupees). The West end of the pukka Road on the North-side at the Wood Bazar is entirely worn out, and in con-

sequence of the encroachments of the wood dealers, the Drainage cannot be kept clear, and is in a very bad state. When the Canal is authorized to be cleared out, estimates for the repairs of the Roads will be forwarded. The Road is not required while the Canal is in its present state.

" 8. The Canal is to be dredged as soon as the Boat is ready: since the original estimate Balliaghatta Canal. was made (March 1834), the Banks have fallen in in several places, and there is probably 400 Chowkas more of mud deposited: this Canal continues in the usual state blocked up by Boats fastened across. The Roads are in a bad state, and frequently interrupted by obstructions and encroachments, it may be necessary for me to observe however, that when Mr. Wells was Magistrate of the 24-Purgunnahs, obstruction of all kinds were removed from the Canal and the Roads. The navigation was thereby kept open, and I did not hear of a single accident occurring. The reform in the police and management of this and the other Canals proposed by Captain T. Prinsep, 10 years ago, and which has been agitated since that time, is very much required.

" 9. The Channel through the Salt Water Lake continues precisely in the same state that it was last year, and therefore requires no remarks. Former estimate was 3,275 Rupees.

" 10. All these Canals are in the same state as last year with the following exceptions: The Hussanabad Canal has perceptibly widened, and also deepened a little at the East end—the Chaltabarryah Canal is considerably wider, but the Sand-bank near the West end has apparently increased a few inches—the Bhowannypore and Bayley Gunge Canals are decidedly shallower than last year. The impracticability of my preserving Tide Gauges in these Canals prevents my reporting on the depths with certainty and confidence. The widening of the Chaltabarryah Canal has been caused by the number of Boats lying in that Canal obstructing the Channel and increasing the current, and as this widening has taken place opposite those places which were inhabited, and where grain was stored, all the ground bought for the Canals, has been washed down, and in some places ten feet more; as there was [no] demand for ground at those places where any remained, none has been let.

" 11. The number of Boats passing through these Canals do not exceed one-half or one-third of what they were last year, this arose from the navigation being obstructed at Calcutta, and also to some of the Canals being shallower. I had the Boats counted that passed through the Hussanabad Canal: the day I was there, 94 Boats passed Westward, estimated tonnage 20,000 maunds, and 59 Boats went through Eastward, estimated tonnage 25,000 maunds, or altogether 45,000, which shows the advantages of these Canals, and the superiority even in their present neglected state over the Sunderbund Channels. The expediency of keeping open the navigation of these Canals will also be apparent, particularly as I have it now in my power, by means of the Steam Dredging Vessel, to deepen and preserve the depth of them, and to meet this expence a Toll of One Anna per 100 maunds could be placed on all Boats passing the Hussanabad Canal, and Half an Anna on those passing through Chaltabarryah Canal. Unless the dredging had actually commenced in these Canals, and the money arising from the Tolls was paid directly from the former to the dredging expences, I am fully aware that the Toll would be avoided, and the Canal deserted: these Tolls would give 4 or 5 months' dredging every year, supposing they should cease to be collected when the work was stopped.

" 12. One Thousand Rupees will be sufficient during the ensuing season to cut the jungle in the Tow-paths of the Sunderbund Canals, remove any trees and sunk Boats, and make petty repairs. These repairs are this season about half completed; the proprietor of Lot LXXXIX. will not permit me to cut the jungle on the Banks of the Gobra Khal.

" 13. After two years' experience I may be permitted to observe, that the duties imposed on me in the Canal Department cannot be efficiently conducted unless the cleaning out of the mud of the Canal as it is deposited, and the repairs of the Banks and Drains, are allowed to be charged from the current expences for the first 2 years, in consequence of the ruinous and

neglected state of the Canals : at present the current expences would be increased from 4,000 to 15,000 Rupees per annum, and afterwards 11,000 to 12,000 would be sufficient. This money would be more than re-paid by an increase in the collections from the Toll, but independent of any such hoped-for increase there are ample funds arising from the present Tolls, the legitimate object of which is (according to Regulation VII. of 1810,) to defray the expences of excavating the Balliaghatta Canal, and to provide for the repairs of it."

I have, &c.,

(Signed) J. THOMSON, Captain.

Superintendent of Canals.

No. 325½. b.

Extract—Letter from Captain J. THOMSON, Superintendent of Canals, to Colonel R. TICKELL, dated 10th April, 1835.

"3rd. One of the consequences of considering the works generally necessary for the Canals under separate estimates and heads unconnected with each other is shown by the

* Para. 2nd It is not the intention of the Governor to incur any expence for the erection of a Bund across the Lake Channel or a Cut from Mr Prinsep's brine-fields to the Byah Nullah.

Extract in the margin,* in which the purpose of the work is lost sight of, and the nature of it misunderstood. The subject referred to is the Embanking of the Lake Channel.

It has been brought forward by me three or four different times, and this is the first answer that I have received, I therefore consider it my duty to put it in its proper light. The Embankment of the Lake Channel formed part of the original scheme for opening the Circular Canal, and was authorized by Government 14 years ago as part of the general plan, it was again sanctioned as a particular work in (or about) the year 1826, and money was advanced for it and the work partly executed. The probable reason for its not having been completed were stated in my last year's Report, and some of the advantages likely to arise from again undertaking it. These were to deepen the entrance into the Balliaghatta Docks, and thereby allow the Canal to be relieved from the superfluous number of empty Boats which now lay [lie] in it. These Embankments would also keep up a great depth of water in the Canal which is much required now, and likely to be more so from

† Which in consequence allows the Tide to run out much slower.

the increasing size of the Lake Channel:† another advantage is, that the Lake Channel can be navigated independent of the tides and winds.

"4th. The object of this Letter being to request from the Military Board, permission to make all repairs required to the Canals and their Banks, so as to keep them in the state they were originally made, and to charge for these repairs in my monthly current expence Bills. I shall then be able to make * * * * * agreements with the work people, and select the most favorable season of the year: these will enable me to do the work with celerity and economy. When any repairs are authorized at present, I have to procure and instruct fresh workmen on each occasion, unnecessarily occupying my time and causing expence by the blunders they commit from ignorance. I am called on by your letter No. 3076, to prevent the recurrence of such blunders, but this is only possible by giving me sufficient work as to occupy the time of those who have been instructed in their business.

I have, &c.,

(Signed) J. THOMSON, Superintendent of Canals.

(No. 326 and No. 327 omitted.)

No. 328.

Extract of a Letter dated the 15th December 1835, from the Military Board to the Governor of Bengal.

" 11th. An estimate was submitted in April, 1834 by Captain Thomson, on the subject of the last item of expenditure before-mentioned, but his estimate included not only the expence of improving the Banks, but also of deepening the Balliaghatta Canal (East of the Koolya Bridge) by excavation.

" 12th. The latter part of this work was rendered unnecessary by the employment of the Steam Dredging Vessel, and latterly has, as stated by the Superintendent, been nearly superceded by the scouring consequent on the admission of a current of water through the Lock-Gates.

" 13th. The annexed Extracts from Captain Thomson's Letter, No. 24, of the 10th June, to the address of the Superintending Engineer, Lower Provinces, and of No. 57, of the 18th July, 1834, to the address of Captain Gowan, with the accompanying Sketch, furnish the necessary information, and point out the necessity of the proposed outlay."

No. 329.

No. 44.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta : 24th November, 1835.

SIR,

In reply to your Letter No. 2801, respecting the embanked Tow-paths in the Salt Water Lake, I have the honor to report, that when I received information that the work was authorized,* I sent to Hazareebaugh for 200 Hill coolies, but am given to understand by the Assistant Commissioner that, in consequence of the disturbances of that part of the country, there will be some difficulty and delay in procuring them. A gang of 25 men arrived 5 days ago, these I had ordered previous to the rains for the Sunderbund Tow-path. These men commenced work this morning. During the rains I was able to throw a great deal of earth into the deeper parts of the water along the line of Embankments, and have thereby made about 200 yards, and filled up one of the large Nullahs.

2nd. A cause of difficulty and delay which it is not in my power to remove, is the crowded state of the Balliaghatta Canal, which prevents the earth, which I am dredging out of it, being carried into the Lake, this being the material with which the Embankment must be constructed at those places covered with water. There being no person on board the empty Boats, or those hauled upon the Banks of the Canal, tracking the Receiving Boats is prevented, and poling them together with the assistance of the tides is so tedious, that they may only make one trip by the day. Until this cause is removed, little can be done, and that at an expence much exceeding my estimate.

* Authorized by
Govt. on the 19th
August, 1835.

3rd. A further difficulty has arisen. On Saturday last, the two proprietors of the fishings of the Lake gave me notice that they would not permit me to shut up any of the Nullahs, unless they were remunerated for the damage done to the fishing thereby. This is rather unexpected, as I gave the parties notice 2 years ago that the work was to be done, to which I received no answer. To form some idea of the amount of their demand, I enquired what reduction of their payment of revenue they expected, and was told that they let each of the large Nullahs at 40 Rupees a year: this is nearly ten times more than the true rent; and it will be necessary to settle the point by jury, according to the Regulation, May 1824. I am not well acquainted with this Regulation, but am sufficiently acquainted with the general practice that, if the parties have much previous notice, stakes and nets will be put across every Nullah for the occasion—and would therefore propose, as I shall be absent for some weeks, that some person, accompanied by two or three competent and respectable witnesses, be deputed to visit all the Nullahs running into the Lake Channel on the NE. side, as far as the 2nd Chokey of Captain Prinsep's map, and all the Nullahs on the SW. side from Chingreeghatta to the Bya Nullah, and to note down the number of nets and fishing stakes which they may see, and the information they may collect from the fishermen they meet, getting the name of the witness and his residence.

4th. On the SW. side there is not more than one Nullah, in which there is likely to be a net; on the NE. side there are 8 or 10, but it will not be absolutely necessary to close more than two of them, the one that is now closed has made a decided improvement, both in the strength of the current at the mouth of the Canal, and in the direction of it. I need not detail the particulars.

5th. The uncertainty attending the execution of this particular estimate, will show how impossible it is for me to give such definite answers regarding the work in which I am engaged, as appears to be expected.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

J. A. CROMMELIN, *Captain,*
Executive Engineer, 1st Division.
For COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

No. 3294.

No. 4796.

TO THE SUPERINTENDING ENGINEER, LOWER PROVINCES.

SIR,

With reference to your Letter No. 2900, of the 3rd instant, I am directed by the Military Board to say that they consider the Report from Captain Thomson, which accompanied it, as very unsatisfactory, and to request you will desire that Officer personally to inspect the Nullahs running into the Lake Channel, number the fishing nets and stakes, and more fully Report on the complaints of the fishermen.

2nd. The Military Board are the more surprised at receiving a Report of so unsatisfactory a tenor on this work from Captain Thomson, as it is one that has been long contemplated and urged by him as of great advantage and necessity—there is no difficulty they observe now brought forward, which might not have been foreseen and provided against, and

some of the objections urged existed in full force at the very time his estimate was submitted, nor can the Board imagine that the progress of the work should be dependent on the arrival of a body of Hill men from the Mofussil, unless laborers are not procurable in Calcutta.

3rd. The work adverted to has been personally inspected by some of the Members of the Board during your absence from Calcutta, the spot where the Dredger is working is about half a mile from the Salt Water Lake, and between it and the Lake the Canal is by no means so obstructed with Boats as to render the free passage of the Mud Boats inconvenient or difficult, nor can they furnish the assertion that the Mud Boats can perform but one trip per diem, with an opinion, that so small a proportion of work is attributable solely to the obstructions they meet with in passing through the Canal.

4th. You are requested to urge Captain Thomson's attention to the necessity of prosecuting this work without delay: if on his inspection he thinks the proprietors of the fishing have any just claim, as he states, for recompense on account of the closing of the Nullahs, he will make a Report, stating the fact and the extent to which he thinks the recompense due. In reply to his proposition for deputing another person to perform the duty, the Board observe, that it is from Captain Thomson alone that a Report on this subject could be considered satisfactory, and they are disappointed at none having reached them, and no communication having been made specifying this difficulty till a call on him to report on the progress effected was made three months after the sanction of the work.

I have, &c.,

MILITARY BOARD OFFICE:

22nd December, 1835.

(Signed)

E. SANDERS,

Secretary Military Board.

No. 329½.

No. 4795.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.

Governor of Bengal.

General Department.

Department of Public Works.

HONORABLE SIR,

We have the honor to acknowledge the receipt of Secretary Mr. Prinsep's Letter, Report on the Tow-paths No. 311, dated the 11th ultimo, and in reply to submit copy of a Letter No. 44, of the 24th ultimo, from Captain J. Thomson, Superintendent of Canals, to the address of the Superintending Engineer, Lower Provinces.

2nd. We regret to find by Captain Thomson's Letter, that so little progress has been made and so many difficulties started by him in making the Tow-paths. These works are so necessary to the navigation of the Canals that we consider their occupation of great importance, we have therefore called upon Captain Thomson, for a fuller Report of the complaints of the fishermen adverted to in his Letter, and have urged his attention to the early completion of the work.

3rd. With reference to the management of the Chitpore Lock-Gates, we did not consider the question as only conditionally settled in Mr. Bushby's Letter, No. 232, of the 19th August last: in that Letter the Government have decided that Mr. G. Prinsep's interests are of subordinate consideration, and the Tow-paths were distinctly refused in Government

Letter of the 25th March last, on the supposition, that his interests alone were consulted in the arrangements, and their sanction was subsequently given to these works on the express understanding, that they were intended solely to improve the line of navigation in the Canals.

We have, &c.,

(Signed) T. ANBUREY, Colonel, Chief Engineer.

W. BATTINE, Colonel, Officiating Member Military Board.

MILITARY BOARD OFFICE: D. McFARLAN, Chief Magistrate, Member Military Board.

22nd December, 1835.

A. IRVINE, Major of Engineers, Member Military Board.

(No. 330 to No. 334 inclusive, omitted.)

No. 334. a.

No. 8374.

Overscer Green begs leave most respectfully to Report for the information of D. McFarlan, Esq., Chief Magistrate, that owing to the Company's Drain being stopped up, at the entrance into the Canal, the water lodges in the Dhurmtollah Main Drain, about 225 yards in length and about 2 feet 9 inches in depth at the Eastern end, and at the Western end 2 inches. He begs leave to state, that if it is allowed to remain stopped up long it will occasion great stench, and will be a great annoyance to the inhabitants living near the Drain. The Drain has been stopped nearly a week.

CALCUTTA :

(Signed) J. GREEN, Overseer.

20th January, 1836.

No. 334. b.

DEAR THOMSON,

This never can be allowed: a great evil is inflicted on the inhabitants of the end of the Dhurmtollah, I saw it this morning, and a more offensive nuisance was never inflicted on any neighbourhood. Let me know please how long it is to be so, and whether it cannot be avoided.

CALCUTTA :

(Signed) D. McFARLAN, C. M.

20th January, 1836.

No. 334. c.

No. 8557.

24th February, 1836.

Overscer Green begs leave most respectfully to Report for the information of D. McFarlan, Esq., Chief Magistrate, that there is a great collection of water in the Dhurmtollah Main Drain owing to the mouth of the Canal being stopped, which reaches near the Union Chapel, and will be a great nuisance to the inhabitants if not opened soon. It extends North and South to Mr. Blaquiere's house on one side, and the Ghowkannah on the other. It is nearly a month since it was shut up.

(Signed) J. GREEN, Overseer.

(True Copy.)

D. McFARLAN,

Chief Magistrate.

(No. 335 omitted.)

No. 336.

No. 71.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 4th March, 1836.

I have the honor to acknowledge the receipt of your Letter, No. 6086, of the 1st March, 1836, directing me without delay to let off the water accumulated in the Dhurumtullah Drain. To carry this order into execution would at once and finally put an end to the work in the Entallee Canal. If the water from the Drain was now admitted into the Canal, it would fill up the Choukas or excavations that have been made, and soften the whole of the mud in the bottom of the Canal. To bale and pump the water out of the holes that have been dug, would occupy 10 or 12 days, and 10 or 15 days afterwards, if no rain should fall in the meantime, the work might be recommenced; but the Dhurumtullah Drain would have in the intermediate 20 or 25 days become again filled, so that the water must again be let off and no work could consequently be done.

2. I have deferred carrying the Board's directions into effect, until I again hear from you, as the Board do not appear to have contemplated giving the work (of digging out the Entallee Canal) up altogether.

3. The 2nd paragraph of the Chief Magistrate's Letter, obliges me in my own defence to state, that the Dhurumtullah Drain was closed for the second time on Monday, the 15th of February, and that since that time not a day or night has been lost by delay: there are now 500 men at work on the Canal, the number being daily increased as the mud becomes sufficiently dry for removal in baskets. If there is no rain before the 25th March, I shall probably be able to open the Drain on that day.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 337 to No. 343 inclusive, omitted.)

No. 344.

No. 19.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta : 10th August, 1835.

The superior economy and efficiency of preserving the navigation of the Canals open by preventing the falling in of the Banks, and the filling up of the Channel, instead of repairing the damage that may be caused by obstructions and encroachments, induces me again to bring to your notice the necessity of giving me power to execute the duties expected from my situation.

2nd. This subject was first brought forward by me in my Letter No. 31, of the 5th June 1833, in consequence of which, I was placed in communication with the Sudder Board of Revenue, by whom a draught of a Regulation was prepared. As this draught has not been acted on to this day, there are probably reasons for the delay of which I am no judge, as the proposed Act regulates not only my duties, but is intended to meet both, the deficiencies of the Police Regulations and also of the manner of collecting Tolls.

3rd. As you are fully aware from my numerous Reports of the injury that the Canals sustain by the rain water being permitted to run over the Banks, and thus cutting them into ravines and causing them to slide and fill up the Canal, I need not report instances of these occurrences, but state the immediate causes of them. Parties occupying the ground along the Banks are continually making encroachments, and as the Drain forms the boundary, it is in the first place filled up by them. To prevent these encroachments, there are two Chaprassies, whose sole business it is to Report and remove them; this method has entirely failed; as the Classies, I have reason to believe, make use of the power given them to raise contributions, and the few who are not permitted to encroach are those who have not the means to bribe. Two years ago, I complained to the Magistrate of the 24-Purgunahs against some of the principal proprietors of ground on the Banks of the Circular Canal, who had caused considerable damage to the Banks and Road by filling up the Drains; the Magistrate summoned the parties, but influential persons interfering in their behalf they escaped punishment, after some correspondence and a promise from the parties of not encroaching again. Since this occurrence, although attention is occasionally paid to my complaints to the Magistrate, I have not heard of any one being punished, or of any encroachments being prevented. A very vexatious consequence of this spirit of encroachment is, that all marks put up by me in levelling and surveying, and also for Tide Guages, are immediately removed, as I suppose they are considered land-marks. Trifling as this may appear, it prevents work being marked out with accuracy, or afterwards measured when in progress; and it more than doubles my own labor, and occupies my time with the duties that an Overseer could otherwise perform.

4th. Another obstruction in the Canals, injurious to the stability of the Banks and the depth of water, is the manner in which the Boats are fastened across the Canal, or anchored in the middle of it; the consequence of this is that sediment is deposited under the Boats partly from the current being obstructed, and partly from the filth and dirt thrown out of the Boats—and besides which a strong current is thrown against the opposite Bank of the Canal, which washes it down, depositing the earth below the obstruction. My appeals to the Magistrate to remove this evil were of no use until about 8 months ago, when the evil was effectually removed for a few weeks: but one of the parties who considered himself inconvenienced, appealed to the Commissioner, who cancelled all the Magistrate's orders on the subject; since that time the nuisance has continued as formerly.

5th. Provided the Boats in the Canals are properly regulated, and the Drains always kept open, there ought to be little or no expence incurred for repairs except for Roads and Bridges, and the removal of sediment brought into the Canal by the Town Drains.

6th. The obstruction caused by the Toll and Custom Chowkees are of little importance, as far as injuring the Banks are considered, which is the object I wish to explain in the present Letter.

7th. The foregoing cases which I have brought forward as examples are not meant as complaints against any one, but only to show the insufficiency of the present Regulations: and as some specific proposition is expected from me, I shall conclude by stating what I consider necessary to remedy the evils complained of. Although there is no doubt, but that both the Police and Fiscal Regulations of the Canals could be greatly improved, and at the same time facilitate the performance of my duties, yet I shall avoid introducing them in any

way, as it would only lead to delay similar to what is stated to have occurred in the 2nd paragraph of this Letter.

8th. The substance of the enactment proposed is—"That any person who shall wilfully hinder, or prevent the free passage of Boats on the Canals, or who shall encroach on the Banks so as to cause damage or obstruction, such offender shall, on conviction by a Magistrate, pay a fine not exceeding 50 Rupees, and also pay to the Superintendent of Canals a full satisfaction for the damage done, and the obstruction or nuisance laid on the Bank shall be forfeited and sold for the use of the Canal." I also require authority to seize and send to the Thannah any transient or unknown person guilty of the above offence.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 345 to No. 355 inclusive, omitted.)

• No. 356.

No. 783.

FROM COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,
Secretary Military Board.

Barrackpore: 24th June, 1836.

Canals.

SIR,

With reference to your Letter No. 6968, of the 12th of April last, I have the honor to enclose copies of Letters received from Captain J. Thomson, as noted in the margin,*

relative to a more permanent and economical measure for preventing the filling up of the Canal by the Town Drains than the employment of the Steam Dredging Vessel.

2nd. The measure for this purpose referred to in the last paragraph of Captain Thomson's Letter, forwarded with my communication No. 4431, of the 14th of April, was principally the employment of Cess-pools at the mouths of the Town Drains, as a substitute for a former proposition not acceded to, for re-modelling the Drains and rivetting them with masonry.

3rd. When Captain Thomson first made the proposal for constructing these Cess-pools several objections were made to them at the time, and which still exist, besides which I understand that the depth and level of the Town Drains have been so materially altered within the last two years that it would be necessary before such permanent works as Cess-pools are made, to determine the quantity of water which each Drain should deliver, as also the level of the outfalls; but I agree most fully with Captain Thomson in the opinion, that if that portion of the Drains between the Circular Road and the Canal was put into a proper state by rivetting the sides, and adjusting the slopes, so as to regulate the velocity of the current, it might reasonably be expected that the current of the Canal would remove the greater part of the filth brought down by the Drains, more particularly if Hatches or Sluices

* No. 14, dated 6th June, 1836.
No. 18, dated 17th June, 1836.
Memorandum, dated 27th May, 1836,
relative to Dredging Vessel.
No. 19, dated 17th June, 1836.

were put into the Lock-Gates, to produce a current through the Canals during the rains as well as the dry season.

4th. No Cess-pools would in that case be required, and on the completion of the works proposed for the ensuing season, nearly one-half of which are those remaining of the present season, and which could not be completed before the cold weather. The annual expence for keeping open the navigation of the Canals, and for preserving the Banks in a state of repair, would be little more than that required for current repairs, and for removing the heavier deposits, such as broken pottery, &c., that might accumulate during the year, and a small deposit of mud in the Entally Canal, as stated by Captain Thomson in the 2nd and 3rd paragraphs of his Letter No. 14, of the 6th instant, copy of which is enclosed.

5th. Adverting to the 5th paragraph of Captain Thomson's Letter above-mentioned, in which he recommends that the present Dredging Boat should be rebuilt at an expence not exceeding 16,000 Rupees, I requested him to state more distinctly his reasons for recommending that measure, and the circumstances under which the repairing of the Boat would prove so great a convenience. Enclosed is copy of his reply, No. 18, of the 17th instant, to which I also beg to annex copy of his "Memorandum of the Steam Dredging Vessel," under date 27th ultimo, which he submitted for the purpose of being referred to on future occasions when the subject may come under discussion, and thus save the trouble and delay of repeated and tedious explanations.

6th. With reference to the improved system of operations which we may expect to see brought into effect on the Conservancy of the Canals being placed under the Superintendent, when the impediments which have hitherto obstructed the navigation of the Balliaghatta Canal will be removed, there can be little doubt, I should think, as to the expediency of rebuilding the Steam Dredging Boat, as proposed by Captain Thomson, on a scale and with a draft of water suitable to the Canals; for, allowing that the Drains were rivetted, as recommended, it will be found, I imagine, that the Canals could be more economically cleared out, and at all times preserved at the proper depth by means of the Dredger than by any other method, and certainly with less public inconvenience and loss to the individuals residing on their Banks.

7th. I therefore beg to recommend that Captain Thomson be directed, in communication with the Superintendent of the Government machinery, to draw up a detailed design and estimate of the probable expence.

8th. With advertence to the Letter alluded to in the concluding paragraph of Captain Thomson's before-mentioned, No. 14, of the 6th instant, which was without date or number, but was, it appears, to have been submitted for the consideration of the Military Board, with a plan and estimate for altering the Drains, I called on that Officer for a regular copy, with such alterations or additions as present circumstances might render necessary, as also the estimate adverted to in that communication, and now beg to enclose a copy of his reply No. 19, of the 17th instant, in which he states his reasons for having withheld the proposition in question; but as this is one on which the efficiency of the Circular and Entallee Canals appears mainly to depend, I beg to recommend that Captain Thomson be directed to submit a detailed report on the subject, in communication with the Board of Conservancy, accompanied by explanatory plans and estimate of the probable expence.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, Colonel,
Superintending Engineer, Lower Provinces.

No. 356. a.

No. 14.

FROM CAPTAIN JOHN THOMSON.

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER.

Lower Provinces.

Calcutta: 6th June, 1836

SIR,

I shall now resume the subject of my letter No 4, of the 14th ultimo, namely, a consideration of the best manner of removing and preventing the mud brought into the Canals by the Town Drains.

2nd. The cost of keeping the Circular, Balliaghatta, and Entallee Canals free from

Average annual expence of keeping the Entallee and Balliaghatta Canals free from mud, 5,000 Rs.

mud may be judged of by passed experience. The two last-mentioned Canals have been hitherto dug out every 5 or 6 years at an annual average expence of 3,000 Rupees; and

taking the loss of Tolls during that period at nearly as much more, or 2,000 Rupees—(this is exclusive of the probable increase of Tolls in Tolly's Nullah), the annual expence may be rated at 5000 Rs. to keep the Circular Canal of sufficient depth, and was estimated by Colonel Wood's Committee at 8,000 Rupees a year; and, if a Toll had been levied, the loss of it would have been more than one-fourth of the probable collection, as the Canal would have to be

Average annual expence of keeping the Circular Canal free from mud, 11,000.

dug out every second year; the Circular Canal therefore may be stated at 11,000 Rupees, or 16,000 a year for both Canals. By opening the Lock-Gates, by employing Dredging, and by the

construction of the Dhurumtullah Drain Cess-pool, this supposed expence would be reduced

Circular Canal,	3,500
Balliaghatta Canal, ..	2,000
	<hr/>
	5,500

to 3,500 for the Circular Canal and 2,000 for the Balliaghatta and Entallee Canals, or 5,500. This is the direct expence, but, if the establishment of the Dredging Boat and

Add establishment of the Dredging Boat, and interest on capital,	2,500
	<hr/>
	8,000

interest on the capital expended on it (the Boat) be considered, 8,000 Rupees would be the estimated annual charge, exclusive of establishment and current repairs.

3rd. After the proposed drainage of the Banks (now in progress) was completed, and the sides of the Calcutta Drains rivetted and their slopes adjusted, I do not see any adequate cause for expence beyond the current repairs, which may be clearly understood and determined beforehand, including the removal of a deposit in the Entallee Canal from the muddy water, which may probably amount to 2 inches in the year.

4th. The rivetting of the Town Drains from the Circular Road to the Canal, is not only of great importance in preserving the Canal navigable; but as the greater part of the earth washed into the Canal is derived from the Suburbs between the Road and the Canal, a degradation of the surface is now in progress of 300,000 c. ft. in a year, which cannot be replaced, and which will increase the difficulty of draining it and consequently render it more unhealthy every year. A large proportion of these Suburbs, viz. Coomarpura and Bahar Simleah, are 6 feet below the highest rise of the River, and even this height is acquired by the earth which has been thrown up from the numerous Tanks. To rivet the Town Drains on both sides, and replace the Bridges opposite the various houses, would cost 30 or 40,000 Rupees, about one-third of which being the Western Drain of the Circular Road, would be chargeable to the Town of Calcutta. The estimate is reduced to this sum only by making

(a) That on the other side to be one wide Drain on one (a) side of the Road, instead of two smaller ones on both sides. This is the probable cost of doing the work in a complete manner. It might be done in a temporary and partial way for 5,000 or so; but no plan or estimate can be formed without the co-operation of the Calcutta Conservancy Board. I therefore need not at present say any thing further.

5th. After these improvements to the Drains are executed, a Dredging Boat may not be required on ordinary occasions, but there are circumstances in which it would be a very great convenience; and, judging from past experience, I think these circumstances are likely to occur more frequently than can at present be detailed. Without stating any further reasons for my opinion, I think that the present Dredging Boat should be rebuilt, supposing

(b) See Captain Thomson's "Memorandum of the Steam Dredging Boat," dated 27th of May 1836.

that the expence did not exceed the 16,000 (b) Rupees. To build a Hand-dredging Vessel of one-fourth the power would cost more money: the engine on board the present Boat has all the moving parts in duplicate, and there is a spare set of brasses for the whole of the machinery, so that it may last, with ordinary care, for 30 or 40 years.

6th. While the dredging remains in its present uncertain state, I do not think that more Receiving Boats (which may last for 10 years) should be built; and, without three times the

(c) That is 10 Boats, each holding half a Chowka of earth.

present number, (c) the dredging cannot be carried on with energy and economy. I think it therefore of much importance that the plan of future operations should be determined by the Military Board. In the first place, whether the Calcutta Drains will be altered, as proposed; if not, the Dredging Vessel must necessarily be rebuilt; but if so, it is questionable whether the Boat shall be built or not. If it is determined that the Boat be rebuilt, I should, without any further delay, receive authority for building Mud Boats capable of holding five Chowkas of earth.

7th. Accompanying this Letter I have sent in explanation a copy of a Letter (d) writ-

(d) Regarding the rivetment of the Calcutta Drains.

ten some months ago, but which was not sent, as my communications respecting the Canals were considered by the Military Board so unsatisfactory. It has been forwarded now in its original state, as I have not time to write it again.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 356. b.

No. 18.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 17th June, 1836.

SIR,

As requested in your Letter No. 640, I have the honor to state a few cases in which a Dredging Boat would be a very great convenience, and even so far economical as to cover the expences of it.

2nd. After every means has been adopted to prevent the Calcutta Canals silting up, yet the sliding of the Banks, or the gradual accumulation of broken pottery, or such heavy substances as the current through the Canal cannot remove, will render it so shallow that it must be

either dredged or dug out. Independent of the loss of Tolls by shutting up the Canal to dig it out, the whole of the shops supplied through the Canal with firewood and grain, are deprived for a time of their means of trade, and of course subsistence, and probably of some of their regular customers. The tenant renting a large Wood Bazar in Entallee, the property of the Company, states that he is ruined by the above cause. The report of the Canal being closed, extending to the Upper Provinces, prevents for years afterwards some Boats from coming through it. The high Toll of Tolly's Nullah, with the delays of going through it, besides the dangers of the Lower Sunderbund route, have been undergone on the mere report of the Balliaghatta Canal being closed when only the Entallee portion of it was. These inconveniences would not occur if there was a Dredging Vessel.

3rd. The Bunda to keep the water out of the Canal while it is being dug out, may be afterwards removed with a Box Dredger, such as I successfully used in Tolly's Nullah in January last, so that a Dredging Vessel is not absolutely required for that purpose; but if a Bank was thrown up by the Hoogly, at the mouth of the Circular Canal, or in the Lake Channel, by some of the Cross Nullahs that enter it, there is no possible way of removing these obstructions except by a Dredging Vessel.

4th. The utility of the Dredging Vessel was almost entirely lost in the Nuddea Rivers from her great draft of water; she could not venture into those parts of the Rivers where her services would have been most useful, as by the fall of the River she might have been left aground until a succeeding rains, if not entirely destroyed. The great weight of the vessel,

(a) And a draft of $6\frac{1}{2}$ feet. 280 tons, (a) was also unfavourable to her utility. With a reduced

(b) As proposed, draft of 3 feet, and a weight of 150 Tons, (b) the Vessel would be suited to any work likely to be required in India.

5th. A few years ago, there were five or six Hand-dredging Vessels in use, besides the Steam Dredging Boat; the working of these Boats have been stopped more from motives of economy than from the inutility of dredging. I may therefore observe, without presumption, that the same causes exist for keeping up the system of dredging (on an economical scale) that induced the Government to build the Vessel originally.

6th. All that can be done at present is the consideration of the principle of keeping a Dredging Boat to meet such contingencies as I have suggested in this Letter; and, if it should meet your approval and recommendation, then I would draw up a detailed design for the Superintendent of the Government Machinery, and afterwards make out my estimate.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 356. c.

Memorandum of the Steam Dredging Vessel.

27th May, 1836.

The original design of this Boat by Messrs. Bolton and Watt, as far as can be ascertained from their plan, was defective in some respects. The principal error was in having made too little allowance for the displacement of the Boat; the Buckets also appear to have been made heavier than originally designed.

2nd. The error in the displacement arose no doubt from their not being aware, or having neglected to consider, the specific gravity of the wood with which the boat must necessarily have been built in India. This error was at once detected here, and a new design for the Boat had to be drawn up; by this design the breadth was increased from 20 feet to 25 feet,

and the draft of water increased from 4 feet 6 inches to 6 feet 6 inches, or the displacement was increased from 6,000 cubic feet to 10,000 cubic feet. This great increase became necessary not only on account of the saul-wood being heavier than the fir, but the scantling of the whole of the framing was increased more than one-fourth. The weight of the hull and

Estimated weight of Dredging Boat.

	Tons.
Engine, including fly, crank, shaft, &c. . . .	12
Boiler 5, with water 4, and a week's fuel 5, . .	14
Buckets, chain, lower tumbler, rollers, &c. . .	6
Connecting machinery, shafts 2, wheelwork with	
upper tumbler 3,	5
Plumber blocks and fixed machinery,	3
Other machinery unconnected,	4
Stores,	6
	<hr/> 50

Framing and Hull, 230

Total weight, Tons 280

framing by the original design was 120 tons, while at present it is 230 tons. I shall be able to show that, with some immaterial changes, the weight can be reduced to the original design, but I believe not below that. The power of the engine appears to be considerably below what it ought to be, principally, I conjecture, from the want of a supply-pump. The reason for the increased weight of the Buckets cannot

be conjectured, but from this weight and other causes, it was found that when the machinery was first put together, the engine was incapable of dredging except in the very softest sand : this fact will be the means of forming a pretty correct opinion of the powers of the Dredging Boat—they may be calculated as follows : the weight of the connecting machinery being 11,200 lbs. the friction will be a little more than a fourth or 3,000 lbs., which moved at the average rate of 22 feet per minute, equal to 66,000 lbs., raised one foot high or two horse power. The power of the engine being estimated at 12 H. P., leaves the power, with which the upper tumbler would be turned, 10 H. P. The weight of each Bucket, with bolts, chains and other moving parts, is 4 cwt.; there are 18 Buckets, and 9 of them being partly filled with 1 cwt. of sand each, gives $4 \times 18 \times 9 = 4$ tons 1 cwt., or 9,000 lbs. The tumbler made 9 turns, or moved at the rate of 72 feet per minute, the friction will therefore be $\frac{33,000 \times 10}{72 \times 9,000}$ or half the weight. To enable the Boat to do work, the rate of motion was reduced in the proportion of nine to five; the power therefore to move the connecting machinery will be as 9 : 5 :: 2 : 1.1 H. P., leaving 109 H. P. to turn the upper tumbler : of this power turning the Buckets expended $\frac{9,000 \times 40}{2 \times 33,000} =$ H. P. nearly, leaving five horse power to excavate. This power is amply sufficient in ordinary soils, but in very stiff clay the engine is brought up, this is an evil of less importance than that which now occurs ; when logs of wood are caught between the Bucket and ladder, something is either broken or damaged.

3rd. In order to improve this Dredging Boat (with the same machinery,) it is evident that it would be proper to revert to the old rate of working, and reduce proportionally the size of the Buckets, and consequently all the framing, &c. dependant on that weight : also to make the displacement of the Boat what it originally was intended to be, reducing the draft to three feet by increasing the length. Instead of the present enormous mass of timber in the bottom and sides of the Boat, stiffness and strength would be attained by two trussed framings 11 feet high, running the whole length of the Boat. To do the same work, the size of the Buckets would have to be reduced, as the cube roots of the velocities, while the weight would be reduced only as the square roots : nevertheless, as the power required for digging would be reduced in the same proportion as the power required to move the Buckets would be increased, the same effect would be produced nearly by the same power, and the Boat would be more handy and manageable. There are a great many minor improvements which the experience of the present machinery would suggest ; these need not be stated in a short memorandum, but as all the proposed alterations have been subjected to calculation, and to plans and estimates, there is no doubt of their practicability.

4th. The hull of the Boat might be rebuilt, and the machinery altered, for 16,000 Rs.

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

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No. 356. d.

No. 19.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 17th June, 1836.

In reply to your Letter No. 638, of the 15th instant, I have the honor to submit for your consideration the plan I proposed adopting for bringing forward the scheme of altering the Drains running into the Circular Canal.

2. When I drafted the Letter, a copy of which I enclosed in my Letter No. 14, of the 6th instant, it was my intention to have drawn up a plan accompanied by an estimate of the expence of altering the Drains in the best manner (in my judgment), leaving it to the Military Board to get the concurrence of the Board of Conservancy—but, as I could not give such a detailed explanation as would meet every possible objection of the Board of Conservancy, and without their concurrence the plan could not be modified, but must have been entirely rejected, I considered it better therefore to get the recognition by the Military Board of the principle of the measure, and to be placed in communication with the Board of Conservancy for the purpose of settling the details: an estimate of the cost could then be made, and the only consideration would be whether the good to be effected is worth the money. The latter way of proceeding, which I have adopted, appeared to me necessary, as the Senior Member of the Board of Conservancy is also a Member of the Military Board.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 357 to No. 360 inclusive, omitted.)

No. 361.

No. 1649.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,

Secretary Military Board.

SIR,

Barrackpore: 30th August, 1836.

Your Letter No. 2048, of the 12th instant, relative to Captain Thomson's proposition for rivetting the Town Drains between the Circular Road and Canal, having been communicated to that Officer, I have the honor to enclose Copy of his reply No. 43, of the 26th idem.

APP. TO APP. H.

2 x

2nd. I perfectly agree with Captain Thomson, as to the importance of the work in question, on which the prosperity of the Circular Canal so much depends, but as it is one which will require much time and consideration, previous to any final arrangements being made for carrying it into effect, I would recommend, that Captain Thomson be directed to proceed with his dredging for the present as if no such project was in contemplation; and which I trust, the Board will enable him to do, by allowing him to repair and fit up the Bhaugiruttee Dredging Boat, as proposed in his Letter No. 40, of the 20th, copy of which I forward to you, with my Letter No. 1646, of this day's date.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Colonel,*

Superintending Engineer, Lower Provinces.

No. 361. a.

No. 43.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

Calcutta: 26th August, 1836.

SIR,

In reply to your Letter No. 1431, of the 15th instant, I have the honor to state, that I would have great pleasure in forwarding the estimates of the expence of the works for keeping the Circular Canal free from silt, if it was in my power, but neither the length, breadth, or depth of the Drains, can be decided on by me, and an estimate of the details is consequently quite impracticable.

2nd. Since the opening of the Canal Locks, I consider the proposition for altering the Town Drains, so as to prevent their bringing mud into the Canal, as the most important to the prosperity of the Circular Canal, and I hope you will not suppose that I am exceeding my duty in again urging the consideration of the manner in which this proposition ought to be carried into effect. I wrote to the Board of Conservancy, but received no answer, I would have applied for a Committee if the Board would have abided by their decision.

3rd. If my request cannot be complied with, I have to beg the favor of a reply to that effect, and I could then proceed with the dredging with energy, instead of adopting expedients to save money in the hopes of being able to dispense with it altogether.

I have, &c.,

(Signed) J. THOMSON, *Captain,*

Superintendent of Canals,

(True Copy.)

*

R. TICKELL,

Superintending Engineer, Lower Provinces.

(No. 362 and No. 363 omitted.)

No. 363. b.

Extract—Report of the Committee appointed to consider and Report on which way the provisions of the Act passed by the Supreme Government on the 26th instant, may be most beneficially carried into effect.

“ 32nd. The powers granted by Section V. of the new Act, for the removal of obstructions from the Canals and Tow-paths should, we presume, extend throughout the whole line of the Sunderbund navigation, as far as the Seepsa Khaul Eastward, where Mr. May's jurisdiction (as Superintendent of the navigation of the upper part of the Delta) commences.

“ 33rd. Many of the natural Creeks in the line require Tow-paths more urgently than the Canals; and the clearing away of the jungle on their Banks is now frequently resisted by the Sunderbund Grantees, who leave a belt of jungle for the protection of their Bunds. The Superintendent will of course look to the mutual benefit of the land-owners and the navigators; but it would be well that all grants should specify that the Bank of a navigated Channel should, for a certain breadth, be liable to occupation for the purposes of a Tow-path or public Road.

“ 34th. The Superintendent will likewise require a separate Office Establishment in his executive capacity as follows:—

“ One Writer, two Jemadars, 10 Peons and three Dingees: the Peons to be stationed, or to range along the whole line of the Canal for the protection of the works and maintenance of order, and to bring Reports to the Superintendent, &c. The estimated charge for this small Establishment is 96 Rupees, as per Appendix F.

“ 35th. Having now disposed of all questions touching the collections and supervision, we will briefly allude to the subject of repairs and improvements, to which our notice is likewise directed by Mr. Secretary Mangles. These will doubtless be brought forward as occasion may demand, and with all the requisite arguments and information by the Superintendent through the regular channel of the Superintending Engineer, nevertheless we may safely venture to place before your Lordship a few of the most prominent wants and improvements that suggest themselves to us.

“ 36th. The amount of the annual expenditure to keep the Canals in working order, including the salary of the Superintendent, may be taken at 30,000 Rupees, leaving full double that amount available for extra works: so that there need be no delay in settling about such as appear the most useful.

“ Of these we may enumerate:—

“ 1. The construction of an Iron Dredging Boat, to contain the Steam Dredging Machine on a new plan, so as to draw less water and occupy less space in breadth. The present Boats have been some time condemned and dismantled. The estimate for the new Boat is Rupees 25,000.

“ 2. The general repair of the Tow-paths, and the bridging of Cuts made for irrigation in various places. Such works cannot be exactly estimated without a full examination of the whole line: nor should they perhaps be included in the present catalogue, being of an ordinary and indispensable nature.

“ 3. The bunding of the Gobra Khall, which will afford the means of scouring the Baley-gunge and Bhowanipore Canals, now liable to be filled up by cross tides. It will be remembered that an attempt to bund the Kalloar Gong with the same object failed after an outlay of 20,000 Rupees: but the mode proposed by Captain Thomson, of applying a chain to the support of the temporary resisting screen, appears to be highly judicious and calculated to ensure success, while the whole cost is not estimated at above 6,000 Rupees.

" 37th. The above we consider to be almost indispensable works. The following we look upon as great improvements.

" 4. Rivetting the Main Drains leading from the Circular Road to the Canal, so as to prevent the washing in of a large quantity of silt. To do this effectually to all the principal Drains would cost 40,000 Rupees, but more accurate estimates would need to be called for, and other material considerations regarding the Drainage of the Suburbs and of the City would require due attention.

" 5. The widening of the Balyaghaut Canal, from the junction of the Circular Canal to the extent of twenty feet, would involve the destruction of the Road on the South of the present Canal, and would cost about 18,000 Rupees. If thought necessary to purchase ground for the construction of a new Road, the price may be calculated at 500 Rupees per Beegah, for 60 Beegahs, say Rupees 30,000, and the making of a kucha Road on the same would come to Rupees 2,500. This work would require more careful estimation, but in our opinion it would much facilitate the navigation to equalize the breadth of the Balyaghaut to that of the Circular Canal.

" 6. The excavation of a Basin at the upper end of the Lake capable of holding say 500 Boats, is also a very desirable object, and we recommend that the Superintendent should be directed to prepare plans for the same; including a Lock-Gate to retain water in it. We may state the probable expence at not less than 30,000 Rupees.

" 7. The closing up of Kamkera Khaul, which now Drains a large Jheel and inundated tract into Tolly's Nullah, causing a bar of sand to be formed at its entrance, is also a desirable improvement for Tolly's Nullah. The principal cost would arise from the necessity of providing Sluices for the admission and discharge of the water elsewhere; the amount may be stated at 7,500 Rupees.

" 8. Connected with the same Canal may be mentioned the Dredging out one mile in length to the depth of three feet below low-water mark, which would cost Rupees 15,000.

" 38th. These estimates are all made in the roughest manner, and are only introduced to assist in guiding Your Lordship's judgment as to which of the proposed works should be first put in hand. The whole would apparently involve an outlay of 1,60,000 Rupees, and consequently would absorb the accumulated surplus of about three years.

" 39th. We will not detain the present Report to enter more particularly into the merits of each work, but we strongly recommend, that the Steam Dredging Boat should be put in hand without delay, as the Circular Canal, and its continuation the Balyaghata, will in a few seasons be rendered unprofitable without such means of clearing out the rapid deposit from the City Drains."

(No. 364 to No. 368 inclusive, omitted.)

No. 369.

No. 83.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 5th December, 1836.

The Board are, I believe, well acquainted with the situation and the extent of the navigation of the Kamapookerya Khaul, which runs into Tolly's Nullah—up to the 1st November last, a Toll House was situated at the Village of Kamapookerya, which collected from every loaded Boat or Saltee that passed, four Annas, the produce of this Toll has been esti-

mated at from 10,000 to 8,000 Sicca Rs. a year, making 32,000 loaded Boats a year, or about 500,000 maunds of grain and straw. There may be about 150 Boats employed in this traffic, 20 of which exceed 25 maunds burthen, by the present rule of measurement, and as these Boats have not entered Tolly's Nullah by passing either of the Toll Houses, I cannot distinguish between these Boats (which have not tickets) and those which have entered the Canal without paying. The Kamapookerya Khaul has no navigable communication with either the Hoogly River or the Sunderbunds, it may therefore be considered as part of Tolly's Nullah, and the Boats remaining in it, and navigating within it and Tolly's Nullah, are chargeable with rent. If the Board concur in this opinion I will make the collection from the 1st instant.

I have the honor to be,

Sir,

Your most obedient Servant.

J. THOMSON, *Captain,*

Superintendent of Canals

No. 370

No. 4534

To CAPTAIN J. THOMSON,

Superintendent of Tolls.

SIR,

20th December, 1836.

I am directed by the Military Board to acknowledge the receipt of your Letter No. 83, of the 5th instant, and to request you will furnish information on the following points, viz. :

First. In what manner the Boats belonging to the Kamapookerya Khaul can be distinguished from others, which navigate the Tolly's Nullah, and how you propose to levy rent on the former ?

Secondly. Whether there is any objection to levying a Toll on the Boats passing out of this Khaul, and whether a Toll House might not be advantageously erected at the mouth of the Khaul, and the same amount of Toll levied on the Boats frequenting it, as at the Toll Houses situated at the ends of the Nullah.

I have, &c.,

E. SANDERS,

Secretary Military Board.

No. 371.

No. 100.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 23rd December, 1836.

In reply to your Letter No. 4534, of the 20th December, I have the honor to state, that Boats belonging to the Kamapookerya Nullah cannot be distinguished from other Boats, but not having tickets I propose to apply the same rule to them as to any other Boat found in the Canal without a ticket, that is, to send it to the nearest Toll House to have the ticket renewed if it has been lost, or another one granted on the payment of Toll if the Boat has entered without payment. If the Boats refuse to show their tickets, I have the power of antedating the renewed one a month, which is equivalent to a fine of 4 Rupees

per 100 maunds burthen : it is therefore the interest of the Boat people to pay the rent regularly, or what comes to exactly the same thing, renew their tickets every 8 or 9 days. With reference to the second question I have to reply, that the expence of making a collection at the mouth of the Nullah, would be greater than the Toll collected, besides the Act would have to be altered to allow of another Toll House being erected. The object, which I propose to attain in collecting rent from these Boats is, that no Boat ought to be found in the Canal without a ticket, otherwise I have no check on the collection, as any Manjee of a Boat may tell me that his Boat belongs to the Kamapookerya Khaul if such Boats are made an exception.

I have the honor to be,

Sir,

Your most obedient Servant,

J THOMSON, *Captain,*

Superintendent of Canals

No. 372.

No. 4789.

TO CAPTAIN J. THOMSON,

Superintendent of Tolls.

SIR,

6th January, 1837.

With reference to your Letter No. 100, of the 23rd ultimo, I am directed by the Military Board to request you will state how far the rent you propose to levy will affect the proprietors of Boats in the Kamapookerya Khaul, and whether the Toll formerly charged on these Boats or the rent now proposed to be levied will give the higher amount.

I have, &c.,

E. SANDERS,

Secretary Military Board.

No. 373.

No. 115.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 14th January, 1837.

In reply to your Letter No. 4789, of the 8th instant, I have the honor to Report, that as 9-10ths of the traffic in the Kamapookerya Khaul is carried on in Salties or Boats under 25 maunds burthen, the few Boats in excess of this burthen will be driven out of the trade, as since my last Letter on this subject not a single Boat exceeding 25 maunds has come out of the Nullah.

2. Judging from the number of Salties and Canoes passing through this Nullah, and the Toll of 4 annas formerly leviable on each of them, about 10,000 Rs. a year must have been received from them. There will now be nothing.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 374 to No. 379 inclusive, omitted.)

No. 380.

No. 73.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

Calcutta : 29th November, 1836

SIR,

At the request of the petitioners I have the honor to forward the petition of a number of merchants residing near Tolly's Nullah. This petition states all the grievances which they say arise from the change in the system of collecting the Tolls on the Canals. The substance of their petition is, that the old plan of collecting the Tolls be again adopted, which of course cannot be granted them, their statement that they pay more Toll now than they did formerly, is probably correct, as the amount of cash received now is 50 per cent. more than formerly, but their assertion that the imports this month are much less than usual is incorrect, as the number of loaded Boats entering have greatly increased in the proportion of three to two, but they appear of a smaller size. It is probable therefore, that the proprietors of a large number of Boats are keeping them back, until they can devise some mode of evading the Tolls. Any of the proposals in their petition (if adopted) would open a door to bribery and other abuses.

2. There is a complaint very general among the proprietors of a large number of Boats (and also referred to in this petition), that the proprietors have no check on the charges made on them by their Manjees for Toll: the tickets or receipts for the Toll given to the Manjees being taken from them on their going out of the Canal. These proprietors might be left to make their own arrangements if it was not their interest to make an agreement with the Toll-keepers, which would end in bribing them. The project has been agitated of registering all Boats, if this plan was adopted by the large proprietors before-mentioned, I could grant them weekly or monthly a receipt for all the Tolls paid by them, which would not only be a check between them and their Manjees, but also between the Toll-keepers and me. The premium I would propose to hold out to those registering their Boats would be, that they would be permitted to pay their Tolls weekly direct into my office, the Toll-keepers being authorized to grant passes to all Boats properly marked and registered, on the note of hand of the Manjee.

3. All that is necessary to be done before this proposition can be adopted is, that the opinions of those most interested be ascertained to the satisfaction of Government.

I have the honor to be,

Sir,

Your most obedient Servant,
J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 381 to No. 390 inclusive, omitted.)

clxxx

No. 390½.

No. 120.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 7th February, 1837.

SIR,

I have the honor to forward the statement of the money collected on the Canals during the month of January last. A considerable sum of money appears to be in the hands of the Toll-keepers, but this was unavoidable; as about the end of the month the Boats with pilgrims began to arrive, and 300 or 400 Rupees a day was collected at each of the two Eastern Chowkies, and it required some arrangement to have in hand such a small sum as 2,000 Rupees.

It will be superfluous for me to report monthly the supposed cause of variations in the amount of collections made. I have herewith added a table of rate or ratio of the monthly collection for an annual collection of 1,000 Rupees. This rate is taken from the average collections of the last 10 years.

			Monthly ratio.		Collected.			Probable annual collection
January, .. ..	..	..	100	..	19,700	..	..	1,97,000
February, .. ..	..	..	120					
March, .. ..	..	..	125					
April, .. ..	..	..	115					
May, .. ..	..	..	65					
June, .. ..	..	..	65					
July, .. ..	..	..	60					
August, .. ..	..	..	60					
September, .. ..	..	..	65					
October, .. ..	..	..	70					
November, .. ..	..	..	75	..	15,700	..	..	2,09,000
December, .. ..	..	..	80	..	17,100	..	..	2,14,000

1,000

The three months collected will, according to this scale, give an annual collection of two Lacs. The monthly collection being divided by the monthly ratio will show the probable annual Jumma.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 391.

No. 5635.

FROM THE SECRETARY TO THE MILITARY BOARD.

TO CAPTAIN J. THOMSON,
Superintendent of Canals.

Dated 10th February, 1837

SIR,

I am directed by the Military Board to request you will inform them, what, in your opinion, would be the probable effect on Tolly's Nullah if the navigation from the Hooghly to the Kidderpore Bridge were declared free, and if the Toll House were removed to the north of this Bridge.

2. Also what would be the probable effect if the navigation were thrown open as far as the Allipore Bridge.

3. Or, if in either case instead of making the navigation perfectly free, a second Toll House were built, and the Toll exacted on this portion of the line limited to one-fourth the total rate.

4. The subjects of consideration in such case are—

1st. The convenience of the Public.

2nd. The state of navigation of this part of the Nullah, which such a system of things would induce.

3rd. The interests of Government, as far as the collection of Toll is concerned.

4th. Its influence on the value of landed property on the Banks of the Nullah.

5th. The Board are also desirous of learning whether in your opinion, in the event of any change being effected, it would be better to admit of different rates of Tollage on this portion of the Canal having the amount determined by the distance travelled or at once to diminish the Toll exacted along the whole line one-half or by one-fourth.

6th. Further, you are requested to state if you think any part of Tolly's Nullah might with convenience be declared free, if so, to what spot such freedom of navigation might extend, and the sacrifice or probable sacrifice Government would make thereby.

7th. In your monthly Report of collections for January, the Board remark a sum of Rs. 3,513-3-0, received at Kidderpore. The Board desire to know what proportion of that amount was derived from the Coal Dépôt of Messrs. Carr Tagore and Co., as well as the number of Boats that passed the Panchpotah [Panspottah] Chokey, after having paid Toll at Kidderpore.

8th. If in your power to give the subject immediate attention, the Board request you will favour them with an early reply.

I am, &c.,

(Signed) E. SANDERS,
Secretary Military Board

No. 392.

No. 123.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 20th February, 1837.

An early reply being required to your Letter No. 5635, of the 10th instant, I have the honor to state in reply to each paragraph in detail.

2. If the navigation of Tolly's Nullah, from the Hoogly to the Kidderpore Bridge, were declared free, it would be necessary to state some preamble or reason for the change which would be equally applicable to the other four Toll Houses, but as a similar indulgence could not be granted in all these cases, it might cause more dissatisfaction than the benefit likely to arise from the change. The loss of Tolls to Government would be about 1000 or 1500 Rupees in the year, without any benefit to any one except the proprietors of the ground, who could charge a greater rent. The mouth of the Nullah would be made use of as a dock for empty Boats, these might no doubt be summarily removed, but an order to effect this would cause as much obstruction to the navigation as permitting them to remain. I have stated, that if the Toll House were removed to Kidderpore Bridge, that the proprietors of Kydgunge would be benefited to the extent of the difference of Toll nearly in the rent of the land, but this would be only in the single case where the ground was rented for storing articles brought from the Hoogly, and to be again taken into the Hoogly for expenditure, and coals appear to me to be the only description of goods to which this is applicable. I am informed that Messrs. Carr, Tagore and Co. are making arrangements for removing their Depôt from Tolly's Nullah, whether any alteration in the Toll takes place or not—and the ground will probably never be used as a Coal Depôt again.

3. The foregoing remarks are also applicable to the second proposition of placing the Toll House at Allypore Bridge, with the addition, that as all (4.5ths) the grain, straw, firewood, vegetables, fruit, fowls, &c., (with the exception of earthenware) come from the Eastward of Allypore Bridge, the Orphan Gunge Bazar could be cut off from all country supply, and must pay the Hoogly (that is the Calcutta) prices for every thing.

4. The third proposal of collecting a reduced Toll at the mouth of the Nullah would involve an expence of double or treble the probable amount of collection, and render it necessary to stop every Boat three times instead of twice: other practical difficulties probably exist, as I do not see clearly how the details are to be arranged: my Office business would be increased one-half more.

5. My reply to the five subjects of consideration, stated in the 4th paragraph, is, to the 1st,—The public must be inconvenienced by any change even for the better; but from simplicity to complication much more so. 2nd,—Making the navigation free communicating with the Hoogly, would place the Nullah in the same situation as that of the Hoogly: the navigation would be stopped by Boats lying there. Any order to remove them would be an order for the exaction of a fee to the public for permission to remain: no system of passes or rent could be applied for reasons stated in the 4th paragraph of this letter. 3rd,—The interests of the Government will not in the least degree be interfered with. The large collections that have been made show, that the Government can get any sum they consider reasonable, although they may give up the Tolls to the Westward of Allypore Bridge, or any limited distance. 4th,—With the exception of the coal sheds, the proposed change would have no influence on the value of land on the Banks of the Nullah. The ground is too distant to be used for warehousing European goods, and it is already occupied by bazars and stores for country goods, the greater part of which come from the Eastward. 5th,—Any reduction which it

may be considered proper to make in the amount of Toll proposed to be collected should, for reasons before stated, be made on the burthen of the Boat on the whole navigation, and not by any partial exception of a portion of the navigation; in the first case the public would benefit by the reduction, in the second case only a few individuals.

6. The number of Boats that entered Tolly's Nullah at Kidderpore during the month of January, was 1260, having a burthen of 3,48,950 maunds—of these 562, burthen 2,06,300 maunds, passed out at Panspottah, and about 1,00,000 maunds returned into the Hoogly. I am informed that these latter went into the Nullah partially loaded and returned with freights of firewood and grain for the supply of those residing on the Banks of the Hoogly.

7. Messrs. Carr, Tagore and Co. brought no coals into the Nullah, and I believe carried none out by Boats. I have no returns, but am told that they loaded some Boats in the River from their Depôt by land carriage.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 393 and No. 394 omitted.)

No. 394½.

No. 73.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 11th March, 1836.

In reply to your letter No. 4,065, of the 9th instant, I have the honor to state, that my Bill No. 20, dated 1st September, 1835, included the whole of the expence of the work sanctioned by Government on the 29th September 1834, as referred to in your letter. The whole of the work intended to have been executed was *certainly not completed*, as the rains set in before it was done; however, as the jungle grows every rains, and the Tow-paths are also cut through to drain the lands, the work would have to be sanctioned every year, and the accounts closed in June.

2nd. The gang of Dangur coolies hired at the beginning of the season, were unable to complete the work as expected, in consequence of much extra work having arisen from the Banks of the Choumook, near Chytul, and of the Dhausa Khal, near Hussainabad, having fallen.

3rd. No preparation has been made for continuing this work, nor has it been recommended to be continued, although the utility of it is undoubted, in consequence of my not having any authority to cut down trees or jungle, or make Embankments.

I have, &c.,

(Signed) J. THOMSON, *Captain.*

Superintendent of Canals.

(True Copy.)

J. A. CROMMELIN, *Captain,*

For COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

(No. 395 and No. 396 omitted.)

No. 397.

No. 131.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 8th March, 1837.

SIR,

In reply to your Letter No. 6,077, of the 3rd instant, on the subject of the proposed Docks for Boats at the Salt Water Lake, I have the honor to request that the plan of proposed Docks be returned to me, with the specific alterations required to be made and marked on the face of it.

2nd. The Section of the Docks is the same as that of the Circular Canal, which has been found convenient, and as the average of large Boats occupy a space along each Bank of 50 feet, 25 feet in length of the Canal has been allowed for each Boat: when the Boats are lying along each Bank, there will be a passage of 25 feet wide in the centre, but the Boatmen will probably prefer tying their Boats with the bows towards one of the Banks, in this case each Boat will occupy 25 feet of the Bank, but there will be only one line of them in each Canal.

3rd. The situation of the proposed Docks is between Mr. Prinsep's salt-works and the Lake Channel, as may be seen by a reference to the printed Map of the Salt Water Lake, in the Military Board's Office. The Docks will be rather favourable to the manufacture of salt, and Mr. Prinsep may draw his supply of water from the Docks or not as he pleases.

4th. To excavate the Docks in any other situation than the Lake, will increase the cost enormously, the digging and the quantity of ground covered will, exclusive of the higher price of the land, increase the expence about twenty times. The Banks or the sides of the Docks would also be too high, which is a great inconvenience in loading and unloading goods. The price of the Locks would be the same in both cases. The carriage of the goods between the Docks and Calcutta would necessarily be by water if there were easy access to the Docks by a pukka Road. The Road must be kept in repair at an expence of 3 to 5,000 Rupees a year. The goods would be carried as they now are, by small Boats from the large ones now lying in the Lake Channel. The Lake Channel is now lined with Boats for two miles.

5th. The deeper the water at the entrance of the Docks the more useful they would be, but any situation in the Lake more to the eastward or southward than the present one, has the insuperable objection of want of good drinking water and of a Bazar.

(True Copies.)

EDWD. SANDERS,
Secretary Military Board.

(No. 398 and No. 399 omitted.)

No. 399. *a.*

No. 25

FROM CAPTAIN JOHN THOMSON.

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

Calcutta : 16th July, 1836.

SIR,

On my return from visiting the Sunderbund Canals, I have the honor to report their state, with reference generally to such changes as appear to have taken place during the past year.

2nd. The Embankment made on the Northern side of the West end of this Channel has improved the navigation to an extent exceeding my expectations.
Lake Channel. The communication with the NE. Lake is widening and deepening daily, and already there is 18 inches more water at low-tide in the Balliaghatta Canal than at any former period; the head of the Lake Channel is also 2 feet 6 inches or 2 feet 9 inches deeper from this cause, combined with the Dredging. These improvements are likely to be permanent: an unexpected advantage also has arisen from this work; the NE. Lake has an average level more than one foot below the high-water mark of the Channel, in consequence of this, the current runs up the Lake Channel for an hour after high-water, and permits the largest descriptions of Boats to come up and enter the Canal, being further assisted by the Tow-path on the other side of the Channel. Only 2 large Boats have been lost in this Channel during the last eight months: from 2 to 3 per month was the usual number lost formerly. To these improvements and the opening of the Chitpore Locks, I principally attribute the great increase of Tolls in this Canal during the latter part of the past year: comparing month with month, the Tolls have been more than trebled.

3rd. Nearly one-half of the Tow-path between the Tarda Nullah and this Canal has been destroyed, and become impassable from Cuts made through it by the fishermen; which Cuts have been widened and deepened by the Boatmen passing over them. This was a most useful Tracking-path, and should be renewed, although the expence will be double that of the original cost of making it.
Bhaminghatta Canal.

4th. No change has taken place in this Canal, but the Tow-path of the Biddadhurree has been cut in three places, and the jungle is encroaching on the Channel.
Bhojediggee Canal.

5th. This Canal is about 5 feet deep at each end, and 4 feet in the middle at high-water neap-tides. The soil through which this Canal is cut is bad, and the sand which falls from the sides, is the cause of its filling up. As I cannot propose any permanent remedy for preserving the Canal navigable, it must be cleaned out, and the sooner it is done the more economical the work will be; but I will be unable to give any attention to it next year.
Chaltaburya Canal.

6th. The Tow-path on the West Bank of the Choumook, Bussera, having fallen into the Nullah, and the edge of the Bank being occupied by houses and piles of firewood, the new path will be made on the East Bank. The mangrove jungle is encroaching on the Choital Canal.
Choital Canal.

7th. These two Canals are becoming shallower every year by the sliding of the sands from the sides, they will probably be entirely closed in two years more. The only way of deepening these Canals and permanently
Bhowanypore and Bay-leygunge Canal.

preserving them navigable would be, by damming up the Gobra Khaul. The quantity of water passing through each of these Canals when full, is about 200 cubic feet of water in a second; there runs in the Gobra Khaul about 12,000 cubic feet in a second, and, having its origin in a Lake, it would no doubt give a sufficient scour to deepen and preserve in future these Canals navigable. As Lieutenant Schalch and Captain Prinsep have fully stated the advantages and even necessity of this measure, I need say nothing further about the expediency of it; but the practicability is questionable. Captain Prinsep estimated the cost of damming up the Kulowar Gong (the same size as the Gobra Khaul) at 10,000 Rupees, he expended nearly 20,000 and failed (the particulars may be seen in his report). This shows the difficulty attending such a work; much consideration was given to the best manner of damming up Nullahs by the Committee on the Draining of the Salt Water Lake, of which I was a Member, and I have had some experience (although not very successful) in this kind of work, I therefore think the work practicable, and for a comparatively small sum of money, 3 or 4,000 Rupees. The Natives successfully dam up large Nullahs (100 feet \times 15 feet) for 5 or 600 Rupees. If the Military Board approve of the proposition, I will make enquiries into the particulars of the present case, and frame an estimate.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 400 to No. 402 inclusive, omitted.)

No. 402. *a.*

No. 45.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 29th August, 1836.

SIR.

I have the honor to forward the Estimate for Damming up the Gobra Khaul called for in your Letter No. 1168, dated 26th July, 5th paragraph. Being conscious of the difficulty of execution and risk of failure of the work, I consider it necessary to detail the manner of executing the work, my reasons for so doing, as well as the cost, for the consideration of the Military Board, not for the purpose of getting rid of the responsibility, but to give as much as possible, a confidence in my capability of executing the work.

2nd. Captain Prinsep attributed his failure firstly to the bad soil, which was so soft that the water swept it away as fast as it was thrown in, and no progress was made until he arrived at the stiff yellow clay, found every where in the Sunderbunds at various depths, of from four to six feet. This is a very general complaint, but I have overcome the difficulty by digging and heaping up the earth required for the work before-hand; by this means, the good clay is on the top and first used for the foundations of the Dam; besides which, when the soft black mud has become dry, it hardens and absorbs water very slowly, and is not readily washed away unless disturbed. The second cause to which failure was attributed, was that the piles driven to a depth of five feet, were not strong enough, but ought to have been driven ten feet deep. The calculated greatest figure on each pile acting four

feet from the top is one ton three cwt., so that if the pile was secured at top, one foot in the ground would be sufficient. It is proposed to drive them five feet, and secure the top by an iron chain secured at each end by anchors and piles; when the piles are driven, a temporary Bridge will be made over the Nullah to enable me to commence in the middle, and keep the Dam of an equal height throughout the whole length.

3rd. The Lot No. LXXXIX, adjoining the work, is cleared, so that the workmen can live on the spot; and as I intend to supply them with food and water in addition to the usual pay, I trust I shall be able to secure them against the sickness which was so destructive on the former occasion.

4th. The only cause of failure not noticed, is the want of workmen: when the earth has been dug, the piles driven, and the fascines and gabions made, 800 men could complete the work in two days; if the workmen cannot be got, the completion can be deferred for a few months, or even a year, without any inconvenience or material loss.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copies.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 402. *h*.

No. 54.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 19th September, 1836.

SIR,

With reference to my Letter No. 45, dated 29th August 1836, on the subject of Damming up the Gobra Khaul, I have the honor to forward some references (at the end of this Letter) to report on the subject. I cannot judge how far these papers will elucidate the subject, but, independent of them, will endeavour to place in as clear a light as I can, the merits of the question. In Captain Schalch's original project for Canals he proposed to carry the Cut from the Juboonah to the Chaumook in one Canal, and any of the Nullahs which would cross his line were to be dammed up. To have proposed such a plan, I suppose he must have been unacquainted with the existence (as appears by his plan) of the large Channels which crossed his proposed line; Captain Schalch did not open the Hussainabad Canal; and when Captain Prinsep proposed doing it, there was a great outcry about admitting the salt water into the Juboonah, and the fresh water into the salt manufacturing districts. There was no ground for alarm on either of these suppositions, as the Juboonah joins the Roymungul only 7 miles below the Canal, the width of the Salt Water Creek being twice that of the Juboonah, and twenty times that of the Canal; nevertheless to meet the wishes of all parties, it was agreed to Dam up the Kuloargong. Captain Prinsep approved of the measure, as it would throw a strong current through the Baileygunge Canal, which was even at that time fast filling up with sand. The cause of the failure of the Dam I have considered in my former Letter.

2nd. The cause of the filling up of the Baileygunge, Bhowanypore, and some of the other Canals was supposed by many at that time to be the meeting of the tides in the Canals. By

the meeting of the tides, I mean still water during the ebb or flood ; such an occurrence never happens ; I need not therefore endeavour to show that it is impossible. The existence of this erroneous supposition has up to the present time prevented any measures being taken to preserve the Baileygunge and Bhowanypore Canals navigable. The true cause of the filling up of these Canals is the nature of the soils of which the Banks are formed, viz. a running sand. Captain Prinsep reported the depth of that sand to be nine feet below the surface, or seven feet below high-water neap-tides of the dry season. In paragraph 20th of my Report, dated 1st May 1834, I have given a section of the Bhowanypore Canal, with some observations on the cause of the silting up of this Canal. The quantity of sand that will run into the Canal is, in many places, limited and exhausted already ; and if the Banks were drained and artificial means were used in some of the worst places to protect the Bank, the Canal might be deepened with the hope of its remaining permanent.

3rd. The mangrove and some other kinds of shrubs protect the Banks of the Sunderbund Channels from the effects of the currents, but these shrubs will not grow in sand : but as the sand is washed out of the Canal, the clay Banks fall in and the mangrove thrives very well ; this is the situation of about one-fifth of the Banks of these Canals, which are crossed by beds of sand. The water of the Sunderbunds deposits on the sides of the Channels a soft black mud, favourable to the growth of the mangrove, and if this mud (in the Canals in question) was not disturbed by the water oozing through the Banks from the marshy land on each side of the Canals, the mangrove jungle would soon form permanent Banks ; a few Cuts through the Banks of the Canal would Drain the marshes now behind them, also Banks of puddle would keep the sand out of the Canal ; but at present I have doubts of the practicability of executing these.

4th. By closing up the Gobra Khaul the Baileygunge Canal will be much more benefited than the Bhowanypore Canal ; the former is less obstructed than the latter, and is connected with a larger Channel, besides the general slope of the Sunderbund at that place is SE., and the direction of the Canals is nearly NE. and SW. ; notwithstanding these disadvantages, I expect that there will be sufficient water through the Bhowanypore Canal to keep it open. From the position of this latter Canal, I anticipate that the ebb will run through it much stronger than the flood ; this will be advantageous for several reasons.

I have, &c.,

(Signed) JOHN THOMSON, Captain,
Superintendent of Canals.

References to Reports and Letters on damming up the Sunderbund Channel, West from Hussainabad.

Remarks by Captain Schalch, (without heading or date) respecting the Kulloar Gong, &c., between the 3rd and 11th February, 1824.

Captain Prinsep's Letter No. 2, 26th October, 1826, paragraphs 9 and 12.

Ditto ditto ditto, No. 17, 20th January, 1827, paragraph 3rd.

Report with Letter No. 66, 28th August, 1827. Headed Bayleygunge Canal, Kulloar Dam, proposed Scheme, &c., paragraph 2.

Letter No. 112, 3rd May, 1828.

Ditto No. 119, 30th May, 1828.

Report with Letter No. 130, 22nd August, 1828, under-head Kulloar Dam.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 408 omitted.)

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No. 403. a.

No. 60.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 24th September, 1836.

I have the honor to forward an explanation of what I presume to be the cause of the current running up the Lake Channel for an hour after high-water, as called for in the 2nd paragraph of your letter No. 1879, of the 17th instant.

2. The artificial Channel marked (A.) in the sketch is the only communication which the North-Eastern portion of the Salt Water Lake has with the Lake Channel. The mean level of this part of the Lake will remain nearly the same, whatever may be the size of the opening admitting the tides. I shall suppose that in the dry season the mean level of this part of the Lake is—1.3, high-water—0.6, and low-water—2. The high-water on the entrance Channel being + 0.3, and the low-water—5.6* According to these levels, which are nearly correct, I have made a diagram showing the heights of the tide in the North-East Lake and in the Lake Channel, with the hours of the day, which shows that if the high-water is at 6 o'clock it will continue to run into the North-East Lake until 7, and afterwards run from the Lake into the Channel until 3, when the two tides are again on the same level. The section of the entrance (A.) is about the same as the Lake Channel, and it has sufficient influence therefore on the latter to affect the current for at least one mile down.

3. Formerly the levels and tides did not essentially differ from what they are now, but the very small section of the entrance (A.) could not apparently influence the current in the Lake Channel. The levels and currents are modified about the time of high-water by the tides admitted from the Hoogly by the Canal, the effects of which are shown by the dotted line. To have noticed these latter tides more particularly, would have rendered the subject too intricate.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

* Supposing the influence of the Canal removed—from any Tide Table was made beyond the influence of the Canal.

No. 404.

No. 3340.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

With reference to your Letter No. 2027, dated 27th ultimo, I am directed by the Military Board to request you will call [on Capt] J. Thomson, Superintendent of Canals, for a section of the Gobra Khaul, and of plan and section of the Dam he purposes to construct, also a sketch on a small scale including the Khaul and the Ballygunge and Bhowanypore Canals, with a report, and distinctly showing the advantage he expects from the execution of this work.

I have, &c.,

MILITARY BOARD OFFICE :

25th October, 1836.

(Signed) E. SANDERS,

Secretary Military Board.

No. 405.

No. 122.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 18th February, 1837.

I have the honor to make the following Report on the lands on the Banks of the Circular Canal.

2. The quantity of land on the West Bank is about 129 B. 13 C., of which 91 B. 5 C. are let at a rental of 1,820 Rs. per annum; on the East Bank the quantity is about 148 B., and 15 B. 2 C. may be added in consequence of the width of the Road having been reduced from 70 to 50 feet: of the first quantity of ground, 148 B. 14 C., there is 110 rented at 906 Rs. per annum, the average of the West Bank being 20 Rs. and of the East Bank 9 Rs. I have separated each Bank into divisions, having reference to their position being near or distant from the Bridges. The East Bank is affected more by this position than the West Bank, but the rates of rent of both Banks are more dependent on other causes than their situation with reference to the Bridges. The rates near Manicktullah Bridge, and to the North of it, are very much depressed without any ascertainable cause.

3. The following is the result of my enquiries respecting the value of land in the vicinity of the Circular Canal. If a bazar has been successfully established, the rent will give a return of 200 Rs. per Beegah—100 Rs. of which is a return for the capital invested, and there is a very great risk in the attempt to establish a bazar and to keep one up. The consequence is, that no one would expend capital on vacant land without a lease of at least 20 years. The other purpose to which the lands may be applied is that of Warehouses—ground thus applicable will rent for 70 or 80 Rs., one-third of this will be due for invested capital and risk, and for such a purpose a long lease would also be requisite. Ground with huts lets for 24 Rs., and ground fit for cultivation at 6 Rs. per Beegah. I believe the present ground rent to be high, and propose that the terms of letting should be as follows: The upset price of the West Bank, and within 100 yards of the Bridges on the East Bank, to be 16 Rs., and the rest of the land 8 Rs.,—that the lease be for 5 years, but the tenants have the power of renewing their lease every 5 years, on payment of a premium of one quarter's rent. The leases to terminate at the end of 20 years. The offers to rent land to be put up to public auction. When a lease is thrown up, the tenant to receive the price (at 12 years' purchase of the nett returns) of any pukka building or other permanent improvement on the ground, which improvement may have received the sanction and approval of the Superintendent of Canals. Machinery requiring care and attention, or perishable articles of any kind, would not be considered as permanent improvements.

4. Parties offering 60 Rs. per beegah or more, to receive the lease of the land without their offer being put up to auction. Those lots for which no offers may be made at the upset price to be let from year to year to the highest bidder, the rent to be paid in advance on the lot being knocked down to the party; this lease may be cancelled at any time during the year, on re-payment for such portion of the year as may have to run, and the payment of the assessed value of crops on any other immovable property on the ground.

5. It would be very desirable that these conditions, or others which the Board may approve of, be published early in March, (before the 5th) by which time I shall have prepared lithographed plans of the lots, and would receive offers up to the 1st April, on the 3rd or 4th of which month the offers would be put up to auction.

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6. I have further to request permission to sell (with the final confirmation of the Board) any small lots or portions of ground conveniently situated for parties holding ground in the vicinity.

7. When the lots have been leased out, I intend proposing that tenders be advertized for offers for collecting the rent. I could probably get it done for 15 per cent., the former being guarantee for all defaulters, &c.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, Captain,

Superintendent of Canals.

No. 405. a.

East Bank.

Rates at which the Ground is let on the Circular Canal Banks.

Situation.	Average.	Maximum.	Minimum	Lot.
From Junction,				
Ballecaghatta,	11 8 4	75 0 0	3 8 0	2 to 12
500 Yards,				
Intermediate,	20 0 0	20 0 0	0 0 0	14 to 24
500 Yards,				
Narculdangah,	33 8 4	60 0 0	24 0 0	26 to 56
500 Yards,				
500 Yards,				
Manicktullah,	6 10 6½	10 11 0	3 12 0	58 to 82
500 Yards,				
Intermediate,	4 7 9	6 4 0	3 15 0	84 to 104
500 Yards,				
From Dum-Dum Bridge to River, ..	25 0 0	24 12 0	6 0 0	106 to the end.
Average of the East Bank, ..	8 11 9	75 0 0	3 8 0	

No. 405. b.

West Bank.

Rates at which the Ground is let on the Circular Canal Banks.

Situation.	Average.	Maximum.	Minimum.	Lot odd.
From Junction,				
Ballecaghatta Bridge,	42 9 7½	55 0 0	30 0 0	1 to 13
500 Yards,				
Intermediate,	32 7 8	60 0 0	15 0 0	15 to 23
500 Yards,				
Narculdangah,	27 4 3	60 0 0	7 3 0	25 to 57
500 Yards,				
500 Yards,				
Manicktullah,	8 12 9	15 0 0	6 0 0	59 to 83
500 Yards,				
Intermediate,	6 6 11	16 8 0	4 8 0	85 to 105
500 Yards,				
From Dum-Dum Bridge to River, ..	15 0 4	150 12 0	7 8 0	107 to the end.
Average of the West Bank, ..	19 15 1	150 0 0	4 8 0	

(No. 406 to No. 410 inclusive, omitted.)

No. 411.

No. 6761.

FROM THE SECRETARY TO THE MILITARY BOARD,

To CAPTAIN THOMSON.

Superintendent of Canals.

14th April, 1837.

SIR,

I am directed by the Military Board to request, that you will, as soon after the 30th instant as possible, submit a statement exhibiting the gross amount of Toll collected on the Calcutta Canals, since the 1st November last, under your orders, the amount expence of collection and net proceeds of the Toll.

2. You are further requested to specify generally, the nature of the expenditure for collection, showing what portion has been for establishment, and what portion for other charges.

3. The subjoined form, if filled up, will comprise the information now requested.

1836.	Amount of Collection on Canals, exclusive only of Land Rent.			Expence incurred on Collecting Toll, &c.			Net proceeds of Collection.		
November,									
December,									
1837.									
January,									
February,									
March,									
April,									
Total,				*					
* Of this amount expended in Establishment,									
in Building,									
in Contingent Charges,									
Total,									

4. If in your power, without occasioning delay to furnish this information, the Board would be obliged by your informing them, what portion of the tonnage on which this amount of Toll has been collected, would, under the former system, have been subject to the several Rates then existing.

5. This information would enable them to ascertain, whether a heavier average Rate on burthen has now been levied than was actually the case under the former system, and with this object in view, should you not have sufficient data to give an accurate statement of the above nature, an approximate one would be interesting to the Board.

(Sd.) E. S.

Secretary Military Board.

No. 412.

No. 1.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

Calcutta: 4th May, 1837.

SIR,

I have the honor to make the following Report on the Canal Tolls, as directed in your Letter No. 6761, of the 14th April, 1837.

2. Accompanying this is a statement (A.) of the gross and net collection of the Tolls during the past six months, with an abstract (B.) detailing the expenditure. No observations on these statements appear necessary. The next return (C.) is a comparison which I have attempted between the former collections and the present. I have with great labor gone over the whole of the abstracts, and some of the details of the returns of the Toll collections for the last 15 years, and, by calculating a system of differences and averages, hoped to arrive at the manner in which the money was collected. A great uniformity existed in the averages of the months and years, but by comparing the daily collections the whole was shown to be artificial, and the uniformity of the collection arranged. I have therefore taken the returns of October last as the most correct, the Toll Darogahs and other establishments being on the alert during that month, in consequence of the enquiries then making into the manner in which they executed their duties.

3. I shall consider Tolly's Nullah and the Ballecaghatta Canal under different heads, as they are very differently circumstanced, and first Tolly's Nullah.

4. The point of most importance in this enquiry is, to ascertain the average burden of Boats navigating Tolly's Nullah. The average, exclusive of Boats under 25 maunds, was, by the former rule of measurement, 375 maunds, the present average is three or four maunds above 300—this gives a proportion between the former mode of measuring and the present, of 13 to 11. There have been about 50,000 Boats measured by the present rule, and these have been compared with 300,000 by the former. I have arrived at the same conclusion by other means unnecessary to detail. On this and similar calculation I have filled up the fourth column of return (C.,) by which it would appear, that the present mode of collecting the Tolls takes from the public (7,083 Rupees,) 5 per cent. more than the former (6,746 Rupees). There has been collected in Tolly's Nullah during the last six months, about 63,750, and judging from the average of former years, 32,000 will be collected during the next six months, making the annual collection 95,750, and deducting 5 per cent. leaves 91,000 Co's. Rupees, or 85,300 Sicca Rupees. The annual average collection in Tolly's Nullah has been 66,500, leaving 19,000 Sicca Rupees unaccounted for. By a comparison of the money collected in October last (or when a new Tussildar was appointed,) with the average collection of previous years, the peculation of the native establishments appears to have been from 15,000 to 18,000 in the year. From other sources of information I believe 20,000 to be nearer the sum. The foregoing comparison is made between the money now collected, and the sum actually raised from the public, but if the former regulation had been strictly enforced, the collection would have been at least 5 per cent. more than the present instead of less.

5. The circumstances and charges affecting the Ballecaghatta Canal are too intricate to detail, I shall therefore confine myself to a few facts. By returns in my office made six years ago, the tonnage of Boats entering the Ballecaghatta Canal greatly (10 per cent.)

exceeded the tonnage entering Tolly's Nullah, yet the Tolls collected in the former² amounted only to one-fourth of the latter, but the rate in the Canal was only one-half of that in the Nullah. The average collection in the Canal for many years, has been 16,500 Sicca Rupees, yet in May last year the Tolls were farmed at 42,000 Rupees—the farmer held the farm six months, (when there is the least traffic) he paid to Government 21,000, made a profit of 3,500, his expences exceeded 500, and he lost in bad debts nearly 1,000 Rupees, this would show on the old regulation a collection of about 55,000 Sicca Rupees a year; this sum exceeds the half of Tolly's Nullah collection assumed at 85,300, but the excess can easily be accounted for from the nature of the traffic.

6. The boatmen frequenting this Canal, are much more contented with the present rate of Toll than those of Tolly's Nullah are, and strange as it may appear, I am of opinion, that the money paid by a certain number of Boats now (say 10,000) does not exceed what was formerly paid.

7. The gross collection now and formerly, having been shown to be very nearly the same. I have to consider the different parties on whom the Toll now falls, in this respect the difference is very great, that on empty Boats is of most importance and against the Toll, on these the complaints have been loudest. While the owner or manjee of a single Boat had under the former system to pay the full Toll, besides being subject to such extortion as he might be unable to resist, the rich and influential proprietor of a large fleet, required a bill for the Toll to be sent to him which he paid at his own convenience; in proportion to the indulgence shown, he made a present to the Toll Darogah: the consequence of this was, that four-fifths of the Boats have become the property of merchants importing and exporting their own goods, and as each deals only in one article and does not let his Boats out to hire, the Boats always return empty, whether they have imported grain into Calcutta or exported piece goods into the provinces. The crews are paid by the trip on the condition of making a certain number of trips a year. The evil consequences of this are great; twice the necessary number of Boats are required to carry on the traffic of the country, they come in large fleets obstructing the Canals, there is no competition, and consequently no improvement, and they cannot or will not take advantage of facilities held out to them in the navigation. A 1,000 maunds Boat could formerly get through Tolly's Nullah in ten days, they go through regularly now in three days, the difference seven days, at 2 Rupees 7 annas a day: the hire of the Boat is 17 Rupees, or 7 Rupees more than the whole Toll they pay. I have no doubt but that the present plan of collecting the Tolls will have the effect of breaking up this bad system. Traffic usually increases in proportion to the facilities afforded to it, so that no falling off of the Tolls may be anticipated from the Boats passing through loaded both ways.

8. The next difference is on Boats laden with earthenware, bricks, &c., more than three times the Toll is now taken on such Boats, that is, 80 Rupees a year is now taken instead of 25 Rupees, but the Salties and other small Boats engaged in the same traffic pay nothing now, whereas they paid 4,000 Rupees formerly.

9. The Toll formerly paid on Boats entering the mouth of Tolly's Nullah, as far as Kidderpore Bridge, is one-fifth of the present Toll, but the sum shown as collected in October, greatly exceeds the average collection, as 1,000 Rupees is now taken, more than formerly, without any advantage being given for it, which is no doubt a grievance, but I do not see any remedy that would not be more injurious in other respects. Passengers' Boats pay double what they formerly did, nearly, but it is not denied now that half the number of oars were hid, or rather three out of five. The Boats with native families on board have been freed from search, for which indulgence they have, on several occasions, expressed their thanks, and Suwarry Boats have paid their Tolls more readily than any other class of Boats. I should except the Boats having European passengers on board, more particularly if they should happen to be in the Company's service.

10. In carrying into effect the proposition to farm these Tolls, it will only be necessary, to substitute farmers paying a fixed or monthly rent for the present Darogahs. I would retain the controul I now have in preventing evasion of the Toll on one side, or oppression on the other. I was at one time of opinion, that there should be four farmers, as they might be content with less profits than one farmer with four Toll-keepers, but the uncertainty of the collection at each Toll house is great, and in proportion to the risk must be the profit: the amount collected at all the Toll houses together, is much more regular, and if a lease for three years were given the most would be made of the Tolls.

11. The next half year's collection I expect will amount to 35,000 on Tolly's Nullah and 40,000 on the Circular Canal, or a net collection of 1,75,000.

12. I recommended in one of my reports, that the time allowed for Boats to load and unload in Tolly's Nullah be three days instead of seven, I am now of opinion, that the seven days should not be altered, as it has been found a sufficient limitation.

13. Boats hired by the Commissariat Officer pay a Toll according to his measurement, which is one-third greater than mine, this makes my accounts incorrect to a certain extent. I therefore would suggest that I be permitted to order the measurement of the Boats, or which will be the same thing, that the Commissariat Officer makes it part of his agreement with the manjee of a Boat that he pays his own Toll.

I have the honor to be,

Sir,

You most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 412. a.

A.

Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1836 to 30th April 1837, inclusive.

Calcutta: 3rd May, 1837.

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Toll Houses.	November 1836.	December 1836.	January 1837.	February 1837.	March 1837.	April 1837.	Total.	REMARKS.
{ Panspotah, ..	5,421 8 3	5,675 14 0	6,703 14 0	8,307 8 0	6,038 2 0	4,083 5 0	36,230 3 3	During the month of April the wind has been so uncommonly great as to put a stop to a great part of the traffic.
{ Kidderpore, ..	4,342 4 0	3,798 0 0	3,513 3 0	5,708 13 6	6,115 9 6	3,021 8 0	26,499 6 0	
{ Dhapa, ..	4,741 11 0	6,024 2 0	7,592 6 0	6,966 2 6	5,657 1 6	3,905 15 6	34,887 6 6	
{ Chitpore, ..	1,199 12 0	1,592 0 0	1,921 11 0	2,705 11 6	1,188* 2 0	1,283 3 6	9890 8 0	* The Canal was closed for 13 days to allow the Lock-sills to be repaired.
{ Fisheries and Ferries, .. }	0 0 0	36 12 0	7 0 0	108 1 3	38 10 8	73 9 0	264 0 11	
Gross Collection,	15,705 3 3	17,126 12 0	19,738 2 0	23,796 4 9	19,037 9 8	12,367 9 0	1,07,771 8 8	
Monthly ex- pences, .. }	403 10 0	379 2 0	436 6 0	394 7 0	324 5 0	393 0 0	2400 14 0	
Net monthly Collection,	15,301 9 3	16,747 10 0	19,301 12 0	23,401 13 9	18,643 4 8	11,974 9 0	1,04,370 10 8	
Expended on Toll Houses and Ghauts,	..	..	..	..	..	..	3562 1 9	
Six months' nett Collection,	..	..	..	..	..	..	1,00,803 8 11	

J. THOMSON, Captain.

No. 412. b.

B.

Abstract of the Expenditure.

Months.	Establishment.	Contingent Charges.	Total.		Remarks.
1836. November. . . .	377 0 0	26 10 0	403 10 0		
.. December,	377 0 0	2 2 0	379 2 0		
1837. January,	393 0 0	43 6 0	436 6 0		
.. February,	393 0 0	1 7 0	394 7 0		
.. March,	393 0 0	0 0 0	393 0 0		
	2,326 0 0	74 14 0	2,400 14 0	2,400 14 0	
Building Toll Houses, Ghauts, &c.					
Pauspotah,			541 15 1	Store, materials, cash.	
Kidderpore,			1,549 8 2		
Dhapa,			1,243 11 3		
Chitpore,			434 12 9		
Value of two Tents,	275 3 2				
Deduct two old Toll Houses sold,	64 0 0		211 3 2		
			6,382 0 5		
			5,962 15 9		
			419 0 8	5,962 15 9	
N. B.—A further sum of about 50 Rupees will be expended in painting notices on boards, and erecting them at the Toll Houses and Ferry Ghauts, and to meet which the Tents may be sold for 100 Rupees					Value put on old materials received from the Dredging Boat, that have been used up.

J. THOMSON, *Captain.*

No. 412. c.

C.

Analysis of the Tolls collected in Tolly's Nullah during the month of October, 1836.

1. No. of Boats Passing and Re- passing through Tolley's Nullah.	2. Measured Burden by former Re- gulation. Maunds.	3. Toll taken in Sicca Rupees.	4. Toll that would have been tak- en by the pre- sent Regula- tion in Sa. Rs.	REMARKS.
1157	492,909	4,949 12 6	3,190 0 0	{ Loaded Boats that entered the Nullah at both ends, or having entered empty come out loaded; these latter would be entered twice, but I have made no allowance for that.
1195	4,10,886	1,027 5 6	3,260 0 0	
.. .. .	1400	3 8 0	11 0 0	{ Empty Boats.
62 .. .. .	.. .. .	24 3 9	115 0 0	{ Boats laden with Bricks and Earthenware, &c.
602 .. .. .	.. .. .	317 0 0	507 0 0	{ Boats that entered as far as Kidderpore Bridge only.
1322 .. .. .	.. .. .	243 10 0	0 0 0	{ Boats with passengers.
.. .. .	.. .. .	181 6 0	0 0 0	{ Salties and other small Boats.
.. .. .	.. .. .	.. .. .	.. .. .	{ Ditto from Kawrapookrya Khal.
.. .. .	.. .. .	6,746 13 9	7,083 0 0	{ Or Company's Rupees 7,555-3-2.

J. THOMSON, *Captain.*

No. 413.

No. 62

To CAPTAIN JOHN THOMSON,

Superintendent of Canals.

5th May, 1837.

SIR,

I am directed by the Military Board to request you will, if in your power, furnish as soon as possible, a statement exhibiting the number and tonnage of Boats that have passed into the Circular Canal and Tolley's Nullah since the fiscal duties of those Canals have been committed to your control, showing also the description of goods with which they were loaded, and with reference to the altered system of Toll and mode of measurement for Tonnage, exhibiting as nearly as possible, what would have been the amount collected since 1st November last, had the old rate continued in force.

The Board think it probable, that you may not be able to complete a perfect statement of this character, but they request you will furnish it as fully as the Register you have kept and Records of your Office permit.

I have, &c.,

F. SANDERS,

Secretary Military Board.

No. 414.

No. 3.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 6th May, 1837.

SIR,

With reference to the returns of Boats required by you, in your letter No. 62, of the 5th instant, I have the honor to state, that I have made no enquiry respecting the lading of any of the Boats that have entered the Canals within the last six months. I have given strict orders to the Toll Daroghas not to enquire into or interfere in any manner with the lading of the Boats, as this enquiry could not be made without keeping up the system of searching the Boats, with the natural consequence of plunder and oppression.

The number of Boats that entered Tolly's Nullah were 20,030, average burden of each 305 maunds, and the number that entered the Balliaghatta and Circular Canals, 29,720, average burden of each 150 maunds.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 415 and No. 416 omitted.)

No. 417.

TO THE RIGHT HONORABLE

GEORGE, LORD AUCKLAND, G.C.B.,

Governor of Bengal.

Revenue Department.

MY LORD,

We have the honor to acknowledge the receipt of Secretary Mr. Mangles' letter,

The Board submit a report on the general results of the system of Canal management, established by Regulation dated 1st November, 1836.

No. 464, of the 11th ultimo, and in conformity to the instructions therein conveyed, beg to submit a report on the general results of the system of Canal management,

established by your Lordship in the Regulation bearing date 1st November, 1836.

2. We forward herewith copy of a letter No. 1, of the 4th instant, from Captain John Thomson, Superintendent of Canals, together with its enclosures, and on the facts stated and deductions drawn from them by that Officer, beg to offer the following observations.

3. Captain Thomson states, that the present mode of measurement compared with that formerly used, gives the present burthen of Boats as 303 or 304 to 375, being a reduction of nearly 20 per cent. on the former rate.

4. Captain Thomson also states, that the average rate of Toll on Tolly's Nullah under the old Regulation would, if strictly enforced, have realized about 5 per cent. more than the present rate, but through the venality of the collectors the full rate was not exacted, and about 5 per cent. less than at present was actually levied from the public.

5. The period of one month before the introduction of the present system which has furnished data for the above statement is too short to admit of our regarding the comparative amount of the present and former rates of Toll, deducted by Captain Thomson, as a very close approximation to the truth.

6. The actual financial results on the Eastern Canal or Tolly's Nullah show, that under the operation of the new system the sum of Rupees 62,729 : 9 : 3 has been collected on this line, and judging from the comparative extent of traffic of the other six months of the year, a collection of Rupees 32,000 more is anticipated, this will exhibit a net collection of 90,000 Rupees, the average of former years having been about 70,000 Rupees.

7. On the Balliaghatta and Circular line of Canals the results of the collection have been still more satisfactory. The total amount collected during the past six months has been Rupees 44,777 : 14 : 6, and the anticipated collection for the ensuing six months is 40,000 Rupees, the average collection on this Canal has hitherto been 17,600 Rupees annually, so that on this line the amount carried to the Government account would seem to have been nearly quintupled.

8. On the whole, the net Toll already realized during a period of six months on both lines of Canal considerably exceeds the average amount formerly collected during the whole year.

9. Captain Thomson Reports, that the Toll presses more heavily than it formerly did on the undermentioned classes of persons frequenting the Canals.

1st. On Boats conveying Passengers.

2nd On Boats laden with Bricks, Straw, &c.

3rd. On Empty Boats entering Tolly's Nullah only as far as Kidderpore Bridge. And it entirely relieves from Toll—

1st. All Boats under 25 maunds burthen, which formerly paid about 400 Rupees annually, and which now pass free.

2nd. The Boats frequenting the Kamapokarya Khal or Creek, which falls into Tolly's Nullah, and which formerly paid from 8 to 10,000 Sicca Rupees per annum, and which now pass free.

10. We beg to remark with reference to the pressure of the Toll on Boats conveying passengers, that it is also stated by Captain Thomson that a great portion of the Toll was formerly evaded by this class of Boats by concealing their oars, and that the exemption from search, accorded by the new Regulation, is more highly appreciated by this particular class than by any other.

11. We have already in our Letters Nos. 5411, 5412, and 5414, of the 3rd February last, so fully expressed our sentiments on the subject of making exemption of Tollage for Boats making use of but small portions of the Canal, that we need not recur to the subject of the pressure of the Toll now felt on goods entering the Tolly's Nullah from the Hooghly River, and proceeding as far only as the Kidderpore Bridge, we will merely repeat that whatever alterations or modifications may be made with the view of meeting this evil it will serve only to render the present system complicated, and perhaps to shift the position of the point of grievance.

12. The general result of the system may, we think, be pronounced exceedingly favorable. We have stated that the collections during the past six months exceed the average collection of a long series of years, and that the total annual collection promises to double that of any former year.

13. If this increase were attributable solely to a heavier demand being exacted from the public it would be no subject for congratulation. But from the report of the Superintendent there appears every reason to believe, that such is not the case, and it is a strong fact, that, although the Toll on the Balliaghatta Canal was formerly but half that on Tolly's Nullah,

and that the Tolls on both lines are now equalized, by far the greatest comparative increase in the amount of Toll collected has taken place in the former line of Canal, and this increase to an extent that no possible difference in the supposed amount of rate paid could account for.

14. If it be admitted that the direct collection now made for the benefit of Government does not exceed the amount formerly levied, and a great portion of which was misapplied, the direct gain to the public from the change of system, in the mode of collecting the Toll, cannot possibly be doubted, since unauthorized exaction for an indirect purpose must be raised by oppressive measures, and fall most heavily on the poor and unprotected class.

15. It appears also that greater facilities are enjoyed by the trader, in passing his Boats through the Canal under the present than under the former system, this may be easily understood from the number of Toll houses being diminished, from empty Boats being no longer allowed to remain for indefinite periods in the Canal to the obstructions of free navigation, from the removal of the Toll house at the junction of the Circular with the Balliaghatta Canal, thereby throwing that line open to the Boats that formerly blocked up the head of the latter or Entally Canal, and from the detention caused for the purpose of ascertaining by search the nature of goods embarked, being now removed.

16. In submitting this Report to Government, we are not prepared to advocate any immediate change in the established rate, or mode of collection of Toll on these Canals, still less to advise any partial or local exemptions. Calculating on the augmented revenue derived from these Canals, we have submitted to Government several propositions tending to improve their navigation, and afford increased facility to the traffic and Boats frequenting them, and if all these projects are sanctioned by Government, a considerable portion of the Revenue drawn from the Canals will be returned to the Toll payers in the only legitimate mode in which we think this end can be accomplished.

We have, &c.,

(Signed) D. McLEOD, Colonel, Chief Engineer.

„ D. McFARLAN, Chief Magistrate, Member Military Board.

MILITARY BOARD OFFICE: „ A. IRVINE, Major, Member Military Board.

16th May, 1837. „ T. M. TAYLOR, Major, Member Military Board.

No. 418.

No. 744.

To THE MILITARY BOARD.

Miscellaneous Revenue.

GENTLEMEN,

I am directed by the Right Honorable the Governor of Bengal to acknowledge the receipt of your Letter, dated the 16th instant, in reply to His Lordship's requisition of the 11th ultimo, for a Report of the results, financial and general, of the new system of Canal management, and to communicate as follows in answer.

2. His Lordship considers your Report to be very satisfactory,—the more so, because it seems clear that the increase in the nett income derived from the Canals is attributable rather to improvement in the system of management, ensuring greater honesty on the part of the collecting officers, than to any enhancement of the Toll, for this result Captain Thomson is entitled to much credit, and as it is desirable to place his appointment on such a footing as to obviate any desire for an early change, and thus to retain the benefit of his

local experience, the Governor is now pleased to accede to the recommendation conveyed by your letter of the 31st of March last, and to grant to Captain Thomson a temporary addition to his salary from the 1st of April, of Rs. 150 per mensem, as long as the collection of the Tolls is entrusted to him.

3. His Lordship thinks it desirable that matters should remain for the present, at least, upon the existing footing. The increased produce of the Toll will cover the expences attendant upon the operations for the improvement of the several lines of navigation, and for the convenience of the traffic frequenting them, which have been already sanctioned, or which may hereafter appear expedient. At the end of the year you are requested to report whether any reductions in the rate of Toll are required, and whether they can be effected without sacrifice of the principle of non-discrimination, which appears to be productive of a great preponderance of good. But as far as the information at present before His Lordship enables him to judge, he is inclined to think, that the true interests of the public will be better consulted by the prosecution of the improvements above alluded to, than by a reduction of the Toll.

I have the honor to be,

Gentlemen,

Your most obedient Servant,

ROSS. D. MANGLES,

Secretary to the Government of Bengal

FORT WILLIAM :

The 30th May, 1837.

No. 418 $\frac{1}{4}$.

No. 134.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

TO CAPTAIN E. SANDERS,

Secretary Military Board.

Canals.

SIR,

Barrackpore : 5th May, 1837.

With reference to your letters Nos. 3340 and 6500, of the 25th October and 28th March last, and to my Reply No. 4066, of the 3rd ultimo, I have now the honor to forward a section of the Gobra Khal, and a Plan and section of the Dam which Captain J. Thomson proposes to construct, as also a sketch including the Khal and the Balygunge and Bhowanypore Canals, accompanied by a copy of that Officer's Report, No. 146, dated the 12th ultimo, on the advantages or otherwise that may be anticipated from the execution of this work.

2nd. Enclosed is also a revised Estimate No. 11, of the probable expence of damming up the Gobra Khal, amounting to Company's Rupees 6,496 : 12 : 9.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 418 $\frac{1}{2}$.

No. 146.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 12th April, 1837.

I have the honor to forward the Plans and section of the Gobra Khal and adjoining Canals, called for in your Letter No. 2403, of the 28th October 1836, and have to report, that the object proposed to be attained by damming up the Gobra Khal is to force the water for the supply of the Northern portion of the Gobra Khal and the Jheel with which it is connected, through the two Canals (the Bhowanypore and Baleygunge), as the quantity of water now ebbing and flowing through the Gobra Khal is thirty times more than that which passes through both Canals; the quantity of water to scour out the Canals is ample, and the success of the measure is as certain as such kind of projects are capable of. One cause of failure may be, that the whole of the water will take its course by the Baleygunge Canal and not improve the Bhowanypore Canal, as the outfall by the former Canal is much nearer than by the latter Canal. It is further necessary for me to observe, that it would be expedient to undertake this work only in case it is intended to re-excavate the

An Estimate for this will be forwarded. Chaltabarya Canal, and to execute all other works necessary to keep up the navigation of the Sunderbund Canals.

2nd. If the damming of the Gobra Khal is authorized, the work would be commenced in November 1838, and as the Chaltabarya Canal could not from want of workmen be dug out before the next season, 1839-40, at a probable cost of 15,000 Rupees, the expediency of keeping up this navigation cannot be confidently determined on until the latest period, say, May 1838, but this would be too late to take into consideration the estimates of the proposed works. I would therefore suggest that the estimates for the repairs be now forwarded for the consideration of Government, subject to the condition that they are only to be carried into effect if the Sunderbund Canals are to be kept up. It is highly desirable that the question of whether the Sunderbund Canals are to be kept up or not were settled. For this purpose I shall be happy to collect any information bearing on this point which you may suggest.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 418 $\frac{3}{4}$.

SIR,

16th June, 1837.

I am directed by the Military Board to acknowledge the receipt of your Letter, No. 134, of the 5th ultimo, giving cover to an estimate from Captain Thomson, exhibiting the probable expence that would be incurred in carrying into execution his proposition for Damming up the Gobra Khaul.

2. Captain Thomson, in his Letter No. 146, of the 12th April last, to your address, seems to consider the future maintenance of the Soondurbun Canals as a doubtful point. The

Board are not aware of the grounds on which such a supposition, as the possibility of their abandonment could have been founded. They attach great importance to the preservation of this line of navigation in as efficient a state as possible, and are disposed to recommend any measures which may come before them, calculated on clear and well considered grounds to improve these Canals.

3. The project for Damming up the Gobra Khaul, does not appear to the Board to have received that full and attentive consideration from the Superintendent which the importance of the undertaking demands. And the position of the proposed Dam, whether on the North or South side of the Canal is not distinctly stated. The Board gather from Captain Thomson's report, that he doubts whether the attempt at Damming up the Khaul would be successful, and should it succeed he is still uncertain of the direction in which the waters of the Jheel, from which the Gobra Khaul takes its rise, would pass through the Canal.

4. It occurs to the Board, that this latter point might have been ascertained beyond a doubt by a careful registry of the Tide levels in the Bailey Gunge and Bhowaneepore Canals.

5. Until therefore the Superintendent can more distinctly state his confidence of a successful result to the undertaking, and give a more decided opinion as to the degree of advantage to be derived from this heavy outlay, the Board are compelled to withhold their recommendation to the execution of the work.

6. I am further directed to observe, that the details of Captain Thomson's scheme are too imperfectly developed to enable the Board to come to any conclusion, as to its merits or probabilities of success, nor is the proposition accompanied by any remarks or opinion from yourself, either favorable or unfavorable as to the practicability or advantage of the undertaking.

I have, &c.,

E. SANDERS,

Secretary Military Board.

(No. 419 to No. 421 inclusive, omitted.)

No. 422.

No. 445.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,

Secretary Military Board.

Canals.

SIR,

Barrackpore: 29th May, 1837.

I have the honor to submit for the consideration of the Military Board, copy of Captain Thomson's annual Report, No. 7, dated the 16th instant, on the Canals under his charge for the present season.

2nd. No arrangements, it appears, have yet been brought forward in regard to the Town Drains, but this can only be effectually done in conjunction with the Conservancy Department and Fever Hospital Committee, who I understand have already directed their attention to this important subject, on which it would be useless to speculate until the result of their labours is known, and some definite plan prepared for the Drainage of the Town that shall not interfere, as it has hitherto done, with the navigation of the Circular Canal.

3rd. With reference to the 2nd paragraph of the accompanying Report, Captain Thomson informs me, that the remaining two-thirds of the pukka Road and Drainage of the North side of the Entallee Canal, and about one-fourth of the Banks and Drains of the Balliaghatta Canal, North side, will be finished, the first by the beginning of October, and the second about the middle of June.

4th. Adverting to my Letter No. 180, of the 9th instant, reporting that Captain Thomson had expended the whole of the 3,000 Rupees advanced to him on account of the latter work, and that little more than two-thirds of it had then been completed, that Officer states, that about 1,000 Rupees more are required, but that he has a Balance in hand more than sufficient to meet this contingency, arising from digging out the Entallee Canal and other works executed below the cost at which they were estimated.

5th. In regard to Captain Thomson's proposition for clearing out the sand and mud deposited in Tolly's Nulla by the Kowarah Pookarya Khul, I am informed by that officer, that, supposing the shallowest part to extend 1000 yards at the utmost, 300 being dry at low water, and the Nulla excavated to that extent by hand in April, May and June, 1838, two more seasons, 1839 and 1840, would be sufficient for completing the five miles, which require to be cleared out by the Dredger. The mouth of the Khul above-mentioned being of course permanently closed by a pukka Bund across it, with a Lock and set of Gates, 5 or 6 feet wide. Detailed Plans and Estimates for which, Captain Thomson will submit in the course of two or three months, by which time he will have obtained further and more accurate information on the subject.

6th. I have nothing to add at present on the subject of the expenditure proposed for the ensuing year, as shown in the abstract, which appears moderate, and, after reducing the 2nd item for the excavation of the intended Docks in the Salt Water Lake to 10,000 Rupees, amounts to Company's Rupees 23,700.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Colonel*,

Superintending Engineer, Lower Provinces.

No. 422. a.

No. 7.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 16th May, 1837.

I have had the honor to report so frequently during the past season on the Canals, that an annual report may be considered almost superfluous; but there are some things relating to them that cannot be too often brought forward, and one of these is, the Town Drains, which run into the Circular Canal. The Government have, with liberal consideration, removed all the numerous impediments to improvement under which this line of navigation suffered, excepting this one, of the Drains. All my endeavours to get any improvement made in the Town Drains sanctioned, have been unavailing, and there is no other resource left to me but to recommend that the mouths of all the Drains, leading into the Canal, be

built up, leaving the Board of Conservancy to make such arrangements for the Drainage of the Town as they consider most proper. The benefit that these Canals would derive by closing the Drains would exceed 3,000 Rupees^(a) a year, which

(a) The estimated cost of removing the mud by Dredging. —R. T.

at 15 years' purchase will be 45,000 Rupees; this sum might therefore fairly be debited to the Canal account, and paid over to

the Conservancy Department for the benefit received. Since the year 1832, when Colonel Wood's Committee recommended the closing up of these Drains to the present time, a variety of expedients have been proposed to meet the objections which it is supposed must exist to any improvement in this particular case: I am therefore reduced to the necessity of recurring to the only effectual remedy of the evil, and recommending the closing up of these Drains.

2nd. All the repairs recommended by me two years ago, as required by these Canals, have been now completed, with the exception of about two-thirds of the pukka Road and Drainage of the Entally Canal, North side, and about one-fourth of the Banks and Drains of the Balliaghatta Canal, North side. The efficiency of the Drainage will have to be tested by the rains of one season, and any defects which may appear, remedied before they can be said to have been satisfactorily completed; yet, as far as the effects of these repairs (including those in the Lake) have appeared, they have fully answered my expectations, the Canals having become deeper instead of shallower during the last year. This favourable state of the navigation must be partly attributed to the little rain that fell during the past season.

3rd. The expenditure during the ensuing season on the Circular and Balliaghatta line of Canals will be, (in addition to the usual current repairs to Roads) an extra establishment of five Coolies to remove obstructions from the Drains, of which there are about 13 miles, and to attend to about 700 trees.

4th. The Docks for Boats, proposed to be dug at Chingreeghatta, will occupy the whole of my attention for the season in that direction.

5th. Within the last four or five years little change has occurred in Tolly's Nullah.

Tolly's Nullah. The greatest evil attending this line of navigation is the sand brought into it by the Kawarah-pookrya Khaul. For a long time 600 Rupees a year used to be expended in removing the sand Bank at the mouth of this Nullah. I removed it in the month of December 1835, and last December it had not materially increased, as there had been no heavy rain during the preceding year. Although the worst part of the Bank above low-water mark, formed of the coarsest sand, was thus annually dug out, yet for three miles on the East side and two miles on the West side of the Khaul, the Nullah has been getting shallower every year, and now about five miles of it is not more than a few inches deep at low-water. The least depth of water is stated in the margin.

	Depth.	
High water.	5 feet,	8 inches.
Springs,		
Ditto.		
Neaps,	2 "	0 "
Low-water.		
Spring.	1 foot,	4 inches,
and		
Neap.		
about 300 yards in length: dry at low-water.		

6th. No permanent improvement of the depth of this Nullah can be made until the mouth of the Khaul is closed up. The cheapest manner of deepening the Nullah will be to Dam out the water, and excavate the mud. If the loss of Tolls are taken into consideration, Dredging would be cheapest: either plan will be a very difficult operation. As it may be more than two years before the Dredging Boat is ready, I will state what I consider the best plan of excavating the Nullah. The months most favourable for undertaking the work, all things considered, are April, May, and part of June; with the usual number of workmen I can command, I could in that time excavate in that sandy soil, which dries quickly, about 1,000 yards in length. The work would cost about 4,000 Rupees (there will be about 1,000 Chowkabs), but the loss of Tolls may amount to 6,000 Rupees. The shallowest part of the Nullah would be first excavated, and until that is done, I need not speculate on the cost of the rest of the work.

7th. A considerable *traffic* is carried on by the Kuwarah-pookrya Khaul,^(b) in Damming it up therefore, a Lock about five feet wide for the passing of the small Boats that frequent the Nullah, would have to be constructed. The Drainage of the country would also have to be provided for, and although I have given the subject much consideration during the past six months, yet I have not been able to draw up a satisfactory plan of proceeding, and yet am loath to lose another year—estimates for these repairs in Tolly's Nullah will be framed by me in two or three months, or as soon as I have procured sufficient information.

8th. The success which attended the Dredging in the Ballecaghatta Canal, leads me to hope that, if the Kawarah-pookrya Khaul were closed, and the worst part of Tolly's Nullah excavated by hand, that two seasons' Dredging, at an expence of about 8,000 Rupees, would complete the work, and this arrangement would be most suitable for the carrying on of the other works on the Eastern Canals generally.

9th. The declaration of the Right Honorable the Governor of Bengal, that the Tolls derived from the Canals should be devoted to the improvement of the water communications with the Eastward, has settled in my mind (what I before considered doubtful) the expediency of keeping up the Sunderbund line of navigation; but as there will be as much work as I can attend to, next season near Calcutta, I do not recommend for the present season any work in the Sunderbunds, except cutting jungle and repairing and improving the Tow-paths: for this purpose I have agreed with a gang of *dangur* coolies, and the expences will be as usual, about 900 Rupees.

10th. The following is an abstract of the work to be done during the ensuing season, in addition to the ordinary current expences of establishments and repairs.

Abstract.

No. 1.—Digging out the Dhurmnullah Cess-pool, according to the details of last year's estimate,	800
(c) Expence has subsequently been limited to 10,000 Rs.—R. T.	
No. 2.—Excavating Docks in Salt Water Lake, Estimate No. 6, dated 6th March, 1837, ..	21,515 ^(c)
No. 3.—Damming up the Kawarah-pookrya Khaul, the Estimates for this work will be submitted hereafter,	8,000
Excavating 1000 yards in length of Tolly's Nullah, the Estimates for this work will be submitted hereafter,	4,000
No. 4.—Sunderbund Tow-path, repairs of, according to last year's Estimate, ..	900

35,215

11th. If the plan of proceeding proposed in this report should meet with your approbation, I shall have the honor of proposing to make the Dam on the Gobra Khaul during the season 1838-39, and to re-excavate the Chaltabarya Canal in 1839-40, this last work could not be deferred another year without causing a great proportional increase of cost, besides the entire stoppage of the navigation. With this prospect of work before me, besides what may arise in the course of the next three years, I am of opinion, that none of those works can be deferred a single year, without materially injuring the navigation.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 423.

No. 1057.

FROM THE SECRETARY MILITARY BOARD,
TO THE SUPERINTENDING ENGINEER, LOWER PROVINCES.

SIR,

23rd June, 1837.

I am directed by the Military Board, to acknowledge the receipt of your Letter No. 445, of the 29th ultimo, enclosing a copy of Captain John Thomson's annual report on the Canals, No. 7, of the 16th idem, to your address.

2nd. The Board remark, that they certainly have had before them, complaints from the present Superintendent of Canals, regarding the Town Drains, and they have expressed themselves desirous of adopting measures for removing, as far as possible, the inconvenience complained of, provided any distinct, specific and feasible remedy can be suggested by the Superintendent.

3rd. I am desired on the present occasion to repeat this expression of their sentiments, and to observe, that they cannot possibly act on general representations of difficulty and inconvenience.

4th. The Board can hardly believe Captain Thomson has seriously contemplated the effects of his proposition for blocking up the mouths of the Calcutta Drains, without any other mode of carrying off the Drainage of the Town being devised. They will not therefore further notice it, than by expressing their opinion, that if the current admitted through the Lock-Gates is insufficient wholly to clear away the deposit of silt brought in by the Town Drains, this deposit should be dredged out at the first opportunity, unless the Superintendent can propose some less objectionable scheme for obviating the evil or a more efficient and economical mode of effecting the object.

5th. For this and other purposes, the Board are extremely desirous of seeing the Superintendent of Canals in possession of a Dredging Vessel, which may place the means of effecting improvements and removing impediments of this nature in his hands. Captain Johnston has again been addressed with a request, that he will expedite the dispatch of his estimate for the iron Boat required for the Steam Dredging Machinery, and your attention is requested to my Letter No. 694, of the 2nd instant, calling on Captain Thomson for an estimate for a Vessel to contain the Hand-dredging apparatus, which it is stated has been recently improved and rendered more efficient by the Superintendent at a considerable outlay.

6th The consideration of Captain Thomson's proposition for Damming up the mouth of the Kawrapokarya Khaul, must be deferred until that Officer shall have procured the information alluded to in the 7th para. of his report, to enable him to bring forward some plan for Draining the country, which would otherwise be laid under water during the rainy season from closing the Khaul. This project appears to the Board to be submitted on uncertain grounds, as well as in a vague and unsatisfactory manner, and from the little information Captain Thomson has yet given on the subject, it seems to the Board a measure of very doubtful expediency.

I have, &c.,

E. SANDERS,

Secretary Military Board.

(No. 424 to No. 442 inclusive, omitted.)

No. 443.

No. 1300.

Extract of a Letter from COLONEL R. TICKELL, C. B., Superintending Engineer, Lower Provinces, to CAPTAIN E. SANDERS, Secretary Military Board, Barrackpore: 29th July, 1837, in reply to his Letter No. 1057, of the 23rd ultimo, relative to CAPTAIN THOMSON'S last Annual Report on the Canals, No. 7, of the 16th of May.

“Adverting to the 2nd paragraph of Captain Thomson's Letter, there can be no doubt, I imagine, but that the Town Drains should not be allowed to empty themselves into the Canal and impede the navigation, as they have hitherto done every year, owing to the great quantity of silt and gravel which they bring down and deposit in it; but this serious inconvenience can only be obviated by the Superintendent of Canals, in conjunction with the Conservancy Department, with whom measures might be suggested and arranged for the construction of a Main Drain or Sewer parallel to the Circular Road, or any other plan that might appear most advisable; but until this is done, the Circular Canal will never be free from those frequent interruptions in its navigation, which have hitherto proved so detrimental to its interests, and inconvenient to the public.”

No. 443. a.

No. 32.

EXTRACT OF A LETTER FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,
 TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 17th July, 1837.

“SIR,

I have the honor to acknowledge the receipt of your Letter No. 1011,^(a) on the subject of my Annual Report on the Canals, with a copy of the
 (a) Of the 8th July. Military Board's Letter, No. 1057.

“2nd. The first subject to which my attention is called, is that of the Town Drains; the various projects for remedying the mischievous effects of which I have from time to time brought forward, have not been considered by the Military Board specific and feasible; the remedies proposed appeared to me clear and practicable, as far as regards the Canal, and I have not been permitted an opportunity of bringing before you the effect these changes would have had on the interests of the Town of Calcutta: but I have on several occasions been called on to state my opinions on the combined interest of the Town and the Canal, and in this light I do not hesitate to state, and am supported in opinion by Captain Forbes, and the majority of those who have given their attention to the subject, that the Drains running into the Canals should be closed, and the Drainage of the Town provided for by independent Drains.

"Sth. I was led into the expence of planting the trees on the Banks of the Circular Canal, without previous sanction by Ashootus Day and other natives offering to pay the expence; but after a year's delay I could get nothing but the prime cost of the trees which I had planted—not wishing to lose another season and the favorable opportunity of the Banks undergoing repair. The trees, 750 in number, are fruit trees, and in four years may be expected to give a return of 500 Rupees a year, or pay for the expence of keeping clean and in good order the Banks of the Canal after paying all the expences; this, although a desirable improvement, was not a necessary expence: on this account, I did not propose that the work should be paid by Government; after the trees planted, there was an expenditure of 160 Rupees for trees which had died, and for bamboos, &c., to protect them: this sum was charged in my bill for repairing the Banks of the Canal (marked Bill No. 585, Book H. of 1836-37, Military Board Office, vide Superintending Engineer's Letter No. 3495, dated 3rd February 1837)."

(No. 444 to No. 446 inclusive, omitted.)

No. 447.

No. 636.

TO THE MILITARY BOARD.

GENTLEMEN,

I am directed by the Right Honorable the Government of Bengal, to forward to you the accompanying Copy of a Dispatch from the Honorable the Court of Directors, to the address of the Government of India, under date the 18th of January last, and to request that you will favor His Lordship with a report upon the present condition of the Eastern and Circular Canals, with special reference to the points adverted to by the Honorable Court, viz.

The fitness of the Lock at Chitpore for the object of its construction.

The means employed to remove the silt deposited in the Canal by the Calcutta Drains and the expence incurred on that account during the last three years.

The average number of Boats which pass through daily, and the number which can pass in a day.

Whether the consequence apprehended by Colonel Galloway from the mingling of the waters of the Lake and the River have been felt, and if so, in what degree and with what effect.

The information called for in paras. 27 and 28, of the Honorable Court's present dispatch, relates to the Draining of the Salt Water Lake, adverted to in your Board's Letter, No. 4614, dated the 7th of February 1834. That communication with the

See Mis. Rev. Con. of the
Government of India, 5th
March 1838, Nos. 8 to 11.

measures proposed by the Committee appointed to report on the subject, was brought to the notice of the Honorable Court in a dispatch of the Council of India, dated the 23rd December 1835, but as no reply has yet been received to that dispatch, His Lordship deems it unnecessary to revive the subject at present.

Paras. 67 to 82 of No. 10
of 1835.

I have, &c.,

FORT WILLIAM:
The 9th May, 1837.

(Signed) R. D. MANGLES,
Secretary to the Government of Bengal.

No. 447. a.

Revenue Department.

No. 2 of 1837.

OUR GOVERNOR GENERAL OF INDIA IN COUNCIL.

Para. 1. We informed you under date the 18th January 1837, that paragraphs 2 to 21 of your Letter, under date the 17th February (No. 2,) 1834, respecting the operations on the Eastern and Circular Canals would form the subject of a separate dispatch.

2. Of the 3,50,000 Rupees authorized for the operations on the Circular Canal, we observe by the proceedings referred to in the paras. above noticed, 2,02,155 Rupees have been expended, and there appears to have been proper attention paid to economy and usefulness in the general outlay, the actual cost of the works not exceeding the estimates in the aggregate.

3. The only subject on which we see any occasion to remark, is the modification which you authorized in the plan originally sanctioned for the construction of the Locks at Chitpore, the point at which it was determined to connect the Circular Canal with the Hooghly.

4. Great inconvenience appears to have resulted from the accumulation of silt deposited in the Canal by the Calcutta Drains, an undeniable evil, which it was expected would be removed by introducing a stronger current of water from the Hooghly into the Canal, than would be admitted by the Locks as originally sanctioned.

5. It is reported that the heavy rains in August 1832, did considerable damage to the operations, and to this circumstance is attributed the necessity for the alteration in the original design for the Lock at Chitpore, as appears fully and satisfactorily explained by Mr. James Prinsep.

6. It appears that the conduits which discharge the Drainage of the City into the Canal, and which had been but recently completed at a cost of 12,400 Rupees, were found to "afford too easy a vent for the Drain water, which carries a large quantity of suspended matter into the Circular Canal."

7. This was causing considerable injury to the Canal, and required the application of an immediate remedy, for although the Dredgers were kept constantly at work, they could not, it appears, keep pace with the deposit.

8. The subject was an important one, and induced you to procure the best information, and with that view you appointed a Committee of Engineer Officers to survey the works, the Military Board being directed specially to report thereon.

9. It was necessary it appears, in order to maintain the original plan of all the works, to keep the Canal at a height not exceeding nine feet above zero; as should the height be raised more than ten feet above the zero of levels, it would be even with the Road, and according to Mr. Prinsep, "entirely prevent the Drainage of a considerable portion of the Town whilst it continues at that elevation." It was necessary too, to preserve the level of the Canal, in order to admit of Boats passing under the Bridges; Colonel Tickell therefore agreed in opinion with Mr. Prinsep, that one large Lock of from 30 to 32 feet in breadth, instead of two Locks of 24 feet, would be preferable on the ground of expence of general utility, and the ready means it would afford of throwing open communication with the Sunderbuns.

10. The Military Board considered the accumulation of mud and filth in the Canal over-rated by the Committee, who estimated that during one rainy season 883,000 cubic feet

had collected, and the Board were further of opinion, that the Committee had under-rated the counteraction of the Salt Water Lake in scouring the Canal. The Board gave their reasons for questioning the accuracy of this statement, but the Committee appear, by taking soundings and adopting other modes of procuring evidence during their survey of the Canal, to have obtained sufficient data whereon to found correct conclusions.

11. Colonel Galloway appears to have questioned the expediency, and even the possibility of permanently maintaining the navigation of this Canal, from the shoals arising at the mouth of the Drains. He observes—"No doubt a Lock passage firmly founded and substantially built, with the Banks of the Canal raised sufficiently as Mr. Prinsep suggests, would protect the Town from danger and from inundation, *except by the Drains*, and no doubt also a passage might be formed on a scale small and sinuous enough to be safely opened into the River without any Lock, as the Mahratta Ditch at Chitpore demonstrates. But before we can argue that because such an opening as that of the Mahratta Ditch at Chitpore exists with safety, contracted throughout and winding by a lengthened devious course, that so also the straight and wide Circular Canal, leading from the River by an easy and short line into the expanded basin of the Salt Lake, 12 feet lower than that River also safely exist, we must be prepared to maintain, that all forces are equal, all quantities equivalent, and that extent of cause produces no magnitude of effect."

"The flimsy nature of the Lock passage, proposed by the late Captain Prinsep, submitted as that which had originally obtained the sanction of Government, weighed much with me. By the plan now submitted that has been greatly reinforced and strengthened. The central Pier which was only 8 feet thick is now 26, and the foundations are carried down 10 feet instead of 2, the whole of the work being also piled in front and in rear. If the Canal is to be opened, no expence, no pains ought to be spared to fortify the works of the Lock."

12. There can be little doubt that after the communication with the Hooghly has been effected, the alternate flow of water between that River and the Salt Water Lake, will have some effect in clearing the accumulation at the mouths of the Drains. We are not however, without our apprehensions that this is an evil, which will not be remedied at so easy a cost as you anticipate. The plan of throwing a Bund across the Canal, and removing the deposit by means of hand labour, the most economical mode suggested as the remedy, must materially increase the annual expenditure on account of the Canal.

13. A very important point was brought under notice by Colonel Galloway, namely, the effect which the opening of the Salt Water Lake by means of Canal into the Hooghly, would have on the salubrity of the City, and the general health of the poorer classes in particular, who depend for their supply of water on the River. "The water on the Salt Lake," Colonel Galloway observes, "is within a few degrees of being as salt as that at Saugor—That Lake and the Canal are the common Cess-pools of this immense City, consequently the quantum of salt water, and impurities of the most offensive description brought into the River by an ebb of so long duration, (at certain seasons constant) must be very great. The poorer inhabitants of Calcutta are obliged to have recourse to the River for their water. That water will then be a brackish mixture contaminated with the filth of the Calcutta Drains, for coming into the River on the same side and just above the Town. The water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream, and thus keep its position in shore where alone water is accessible to the inhabitants and to the crowded population afloat in Boats along the side of the River."

14. We trust however that the small quantity of water which it may be necessary to admit from the Lake, will not have "any sensible effect in communicating the saline properties of the former to the River water consumed by the inhabitants of Calcutta."

15. It would appear from a Sketch submitted by Colonel Galloway, that whenever the River, the level of which is during eight months in the year considerably below the level of the Lake, "is admitted into the Canal, so as to raise the water in the Canal one-half feet "above the level of the Lake, that there will commence obstruction to the Narkuldanga "Drain, and so to the other Drains according to their levels. It is manifest equally that in "the freshes of the rains the bottom of that Drain will be 11 feet under the surface of the "River, and that all the Drains will be submerged all of them several feet. Thus it is "demonstrated that the water of the River cannot be admitted into the Canal without "limitation."

16. It is therefore manifest, that great caution is necessary in uniting this Canal with the Hooghly so as to avoid the inconveniences here pointed out.

17. We think, under all circumstances, you decided judiciously in sanctioning the Lock suggested by Mr. Prinsep, which it appears may be used without materially increasing the height of the Canal water. The estimated cost of this Lock is Rupees 50,000.

18. Colonel Galloway calculated that the Lock having only a single chamber, it would be necessary to keep the Gates constantly shut, and that, in that case, only 48 Boats could be passed in one day, and this circumstance alone would impede the navigation and decrease the usefulness of the Canal.

19. We hope it will prove that a greater number of Boats than he supposed may be passed in a day, but at all events, as stated in Mr. Macnaghten's Letter, of the 12th June, 1832, the Lock might be so constructed as to admit of a second chamber, should the inconveniences contemplated by Colonel Galloway eventually arise.

20. We regret to observe by your subsequent proceedings, that an accident occurred at the Lock during an experiment which was made to try the effect of the water from the Hooghly in clearing the Shoals of deposit by which considerable damage was done to the Gates, which appear to have been imperfectly secured, and which involved an expence for repair estimated at Rupees 1,200.

21. The experiment however proved that the current is not sufficient to dissipate the sediment collected by the Drains, and it is proposed as an auxiliary for effecting this object, to make the section of the Balliaghatta Canal equal to that of the Circular Canal, previously to which however, it was considered expedient to excavate the Bunds in the bed of the Circular Canal, which you sanctioned at an estimate of Rupees 2,000.

22. The expenditure that is absolutely necessary to render practically useful such works as have already received our approval, is unavoidable, but you will be specially careful to limit your sanction of any estimates submitted to you, to works of this description.

23. The communications of Captain F. Jenkins, imparting the result of his observations on passing through the Sunderbuns and Eastern Canals, are interesting, and appear to contain useful suggestions, some of which we think might be advantageously adopted with a view to increasing the facilities afforded for carrying on the extensive traffic by means of these Canals.

24. We regret to find that you were deprived of the able services of Mr. James Prinsep, the Superintendent of Canals, by reason of his refusal to certify his accounts on honor, a rule to which it was not competent in you to pass an exception in his favor.

25. We perceive that you have appointed Captain John Thompson, of the Engineers, to the situation of Superintendent of Canals, in the room of Mr. Prinsep, and Agent for the construction of Suspension Bridges, vice Captain Baker, on a consolidated allowance of 600 Rupees per month.

26. Captain Thompson is said to possess considerable talents and science as an Engineer Officer, and we trust that he will efficiently discharge the duties attached to these important situations.

27. In our dispatch dated the 10th November, 1830, in which we took into consideration the proposal of the late Governor General to change the original plan of the Eastern Canal, by making it pass to the Westward of the Salt Water Lake instead of through it, we directed you in the event of your undertaking the work, to be specially careful "to obtain the most absolute accuracy in respect of the soil and the levels."

28. We desire to be informed if those directions have been attended to, and what are the results.

LONDON :
The 18th January, 1837.

We are, &c.,
* * * * *

(True Copy.)

W. H. MACNAGHTEN,
Secretary to the Government of India.

No. 448.

No. 26.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 8th July, 1837.

SIR,

In order that I may reply clearly to your Letter No. 1142, of the 30th June, and to your communication received about the same time, I have added the following returns : A return (A.) of the daily average number of Boats which passed through the Locks, when they were alternately open and shut for a few days at a time. A return (B.) of the number of Boats which have passed through the Locks since the Canal was opened to the present time. A return (C.) of the number of Boats, about 25 maunds burden, which have passed through the Chitpore Locks for the month of April, distinguishing those which have entered at Chitpore, from those which have entered the Canal at Dhappa. Register (D.) of the opening and shutting of the Lock-Gates from 1st August, 1835, to the present time.

2. The months for which return (A.) is made are much more favourable than any other which I could have selected since the opening of the Canal, for judging of the preference given by the boatmen to passing through the Locks when they are open or shut, it appears there is scarcely any difference in the averages, but such as there are would lead to suppose, that the boatmen preferred being Locked through. In the dry season however, the current is not near so rapid as at present, and if a comparison could have been made at that season, I have no doubt but that the preference would be given to the open gates. There exist at present some practical difficulties to tracking through the gates which I shall endeavour to remedy next year. The greatest number of Boats that have passed through the Locks when closed in any one day is 130 on the 24th March last, and the burthen of the Boats was larger than usual, on this occasion, 4-5ths of the Boats passed out of the Canal, and I calculate that the number of times the Locks were filled and emptied in 14 hours' work was 65 times. If the Locks were worked with a double set of Classies, night and day, I believe them capable of Locking through 250 Boats in the day, the total burthen

of which would be about 45,000 maunds, or give a toll of 200 Rupees. This is supposing the burthen of the Boats entering the Circular Canal was nearly equal to the number passing out, but this is not the case: the number of Boats that pass out of the Locks is double of those which enter. I should therefore suppose, the maximum Toll it is possible to raise at the Locks in any one day to be 120 Rupees, and the average Receipts 60 Rupees, the present average being nearly 40 Rupees per diem. If the Lock-Gates were open, there is scarcely any limit to the number of Boats that might pass, perhaps about 1000 per diem. It is requisite to add some observations on Return (C.) This return has only pretensions to an approach to accuracy, to have made a correct return for six months would have occupied my writers nearly two months, and I cannot spare them for two days, and hired writers could not have done it. I selected the month of April because in November and December the people were not accustomed to the new system—during the next three months the number of suwarry Boats prevented any opinion being formed of the extent of the traffic of Boats of merchandise—and May and June were of so recent a date that many of the Boats would remain in the Canal. If the burthen of the Boats was not required I could in the course of a month, with one hired writer, make a return of the Boats which went out at any of the Toll houses, distinguishing the end of the Canal at which they entered: this return could be made from the invoices of the tickets received daily. The total number of Boats apparently accounted for in this return is 1046, but by return (B.) for April 1837, there are 1800, exclusive of small Boats under 25 maunds, this difference is only apparent, as the Boats which went out in April having entered in a previous month are not mentioned, and it is my opinion from daily observation, that the Boats which go out at the Chitpore Locks are twice as numerous as those which enter, and the Boats are of much larger size than they formerly were, and the traffic is increasing so fast that by this time next year, it will have arrived at its maximum, as far as the capability of the Locks, as now managed, will allow of; but with more regularity and attention at some additional expence, double the present number can be daily passed.

3. On the subject of the currents through the Canal arising from the opening of the Lock-Gates, I have added a table of the calculated velocities at the various heights of tide, and the observed superficial velocity through the Locks. Up to November 1836, it was

These levels have reference to Captain Prinsep's Gauge, the Zero of which is 8 feet above the sill of the Locks.

observed that if the tide rose above $+ 4\frac{1}{2}$ feet from July to November, or about $+ 3\frac{1}{2}$ feet at other seasons of the year, the current in the Canal seriously injured the Banks, and

with the former height, large Boats could not pass under the Bridges, and for two hours each tide, Boats could not track through the Locks. In consequence of this observation the Lock-keeper has had directions to shut the gates if the tide is expected to rise to $+ 4$ feet. Since November last the Canal being much less obstructed by Boats than formerly: it has been found that the velocities have increased, and $+ 3\frac{1}{2}$ feet would be nearer the limit now: the removal of the obstructions in the Balliaghatta Canal would have made a greater difference than 3 inches, if the changes made in the Lake and the deepening of the Canal had not caused a higher tide by 4 or 5 inches from the Lake. The ordinary current through the Canal for 8 hours out of the 12 is 24 inches surface velocity, and the simplest explanation of the tides I can give when the Lock-Gates are open, is, supposing it is high-water in the Hoogly at 12 o'clock, $+ 1$ feet 6 inches, it will then be high-water in the Lake at $11\frac{1}{2}$ o'clock, height at \ominus , in this case the current will commence running in from the River at $10\frac{1}{2}$ hours, and reach the Lake at $11\frac{1}{2}$ hours, and it will continue running Eastward till 3 o'clock, the current will then run Westward till $11\frac{1}{2}$ hours. The low-water in the Lake being $5\frac{1}{2}$ hours and that in the Hoogly $7\frac{1}{2}$ hours, the latter falling 2 feet 6 inches below the former, the low-water at the Lock being $- 6\frac{1}{2}$, and at the Lake $- 4$. (The Lake tides here referred to are those at Chengreeghatta.) Besides the direction to open the River Gates

when high-water does not exceed + 4, the Overseer is instructed to open the Canal Gates at the end of the rains, when the low-water before the springs falls to—2, the object of this is to scour the mouth of the Canal into the River before the River Gates are opened. There is usually an accumulation at the mouth of 18 inches of mud, very hard, and which is not removed until February.

4. The effect of the current on removing the mud, brought into the Canal by the Town Drains, is not so well known as the importance of the subject makes it desirable. The first season 1835-36, that the Locks were under my control, the Balliaghatta Canal was so obstructed by Boats that a sufficient current could not be had in the Circular Canal, without injuring the Banks of the Balliaghatta Canal, besides of the 330,000 cubic feet of mud deposited in the rains of 1835, 30,000 was dredged out from the worst place. The least depth of the Canal in October 1835, was 1 foot 8 inches, and in June 1836, 5 feet 8 inches. The Canal was therefore deepened 4 feet, and it was calculated that the current had removed 150,000 cubic feet; this quantity, with the 30,000 dredged, left 120,000 in the Canal spread over the whole length of it. During the last rains of 1836, I was enabled from the lowness of the tides to open the Gates for a few days each month, excepting August; this, combined with the little rain that fell, and some other favourable circumstances, I found in October 1836, the least depth of water, 5 feet 2 inches. In June 1837, 5 feet 11 inches, the very irregular manner in which the mud was spread prevented my measuring the exact quantity added to the 120,000 of the former season, but it must have been less than 100,000 cubic feet. I shall suppose that the quantity in the Canal in October, 1836, was 200,000 cubic feet, about one-quarter of this is a coarse *Soorkee* or Road-dust, which the current cannot remove, and which covers and protects the softer mud below. This *Soorkee* can only be removed by Dredging, and a further accumulation of it can only be prevented by limiting the current in the Town Drains to 24 inches in a second. It may probably be found servicable to drag a hedgehog (or roller with spikes) through the Canal next season.

5. The effect of the current on the bed of the Canal in the last two years has been,—The Canal Basin 150 feet East of the Locks continues to be deepened in a regular manner, (about 1 foot 3 inches a year.) The greatest depth is now 19 feet 4 inches: 250 feet from the Locks, the bottom sloping 9 feet 8 inches in that distance: at Barrackpore Bridge, the depth has increased 6 inches, on the West, as well as on the East side: and on the East side of the Dum-Dum Bridge, has been deepened 1 foot 6 inches beyond what the Canal was excavated, and between these two Bridges the Banks on both sides have lately fallen in, the Canal having become a little wider.

6. The most perfect confidence may be placed in the stability of the masonry of the Locks, this is a fortunate circumstance, as the sudden failure of the masonry during the rains would cause the destruction of all the Bridges, with the Banks and Roads, and cover the greater part of Calcutta with water 5 or 6 feet deep, and if the breach could not be closed the consequences would be incalculable. It is difficult to give an opinion on the repairs that it may be considered necessary to the Gates. Two prime errors (in my opinion) were made in the construction of them. The Quoin posts have been cut up with mortices entirely through them, the tenons having been made 4 times the proper length, the consequence will be that if the Gates begin to sawg, the tenons will be broken, and the Gate go to pieces. The other defect is the pintle has been let into the Gate, working in a cup in the floor of the Lock instead of the contrary, the consequence is, that even now, the heel of each of the Quoin posts is split. If these two defects had been avoided, more particularly the latter, the Gates might have lasted 20 or 30 years, and a failure will not occur even now, from age or decay, but from some accidental strain; it is therefore worthy of consideration, whether a convenient season should not be selected for renewing the Quoin posts at an estimated price, or run the risk by deferring the work, of having the Gate destroyed, or some worse accident

occurring. Mr. Bedford is very careful and attentive, but I can give no guarantee against an accident.

7. No change has taken place at the mouth of the Canal where it enters the River, or in the Banks of the River, nor is there any appearance of change.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 448. a.

A.

Abstract comparative Statement of the number of Boats that passed through the Chitpore Lock-Gates, when they were open and shut.

	Lock Gates.		No. of Boats.	Daily average when open.	Daily average when shut.	Remarks.
1837. March.	Open. from 1st to 10th, 9½ days.	Shut. from 11th to 22nd,	1,055	111		Gates repairing. Maximum No. 130 Boats. Maximum No. 25; an accident having stopped up the Canal.
		from 23rd to 27th, 5 days. ..	518	.. ..	124
April.	from 28th to 31st, and 1st to 4th, 8 days. from 5th to 9th, 5 days. ..	887	111		The high winds began at this time.
			362	.. ..	72½
	from 10th to 19th, 11 days. ..	.. .. from 20th to 23rd, 4 days. ..	650	59	
May.	from 4th to 30th, and 1st to 3rd, 11 days. from 4th to 9th, 6 days. ..	310	77½	
			467	42½		
	from 10th to 18th, 9 days. ..	.. .. from 19th to 26th, 8 days. ..	319	.. ..	53
June.			455	50½		
	from 27th to 31st, 5 days. ..	.. .. from 1st to 5th, 5 days. ..	396	.. ..	49½
			237	51½		
	from 6th to 17th, 12 days. ..	.. .. from 18th to 25th, 8 days. ..	275	.. ..	55
			645	54		
	from 26th to 30th, 5 days.	484	60½	
			290	58		

No. 448. b.

B.

Table showing the monthly number of Boats that have passed through the Chitpore Locks. See Returns dated 8th April, 1834, (28th August, 1834,) 31st March, 1835, 30th June, 1835.

Calcutta : July, 1837.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1833	733	1,347	1,296	1,287	1,441	512	Canal shut 20th December 1833, and opened 19th March, 1834.
1834	...	...	142	609	737	632	764	848	962	1,215	955	718
1835	1,378	1,805	1,575	1,614	1,230	1,302	1,372	1,445	1,526	1,411	1,329	1,538	
1836	1,556	1,339	1,639	1,642	1,624	1,581	1,689	1,769	1,348	1,543	1,361	1,730	
1837	2,434	3,869	2,017	2,100	1,554	1,694	...	...	...	...	...	...

No. 448. c.

C.

Return of the Boats which have entered at Dhapa and Chitpore, in April 1837, and which have since passed out.

Boats entered at				Boats went out at				
Dhapa.		Chitpore.		Dhapa.		Chitpore.		
No.	Burthen.	No.	Burthen.	No.	Burthen.	No.	Burthen.	
2,175	3,84,550			1,734	3,07,800	335	48,475	{ 130 Boats unaccounted for.
		562	1,26,250	376	85,350	149	31,300	
				2,110	3,93,150	84	79,775	

Boats.
 Entered at Dhapa, 2,175 of 3,84,550, Average Burthen, .. 177 maunds.
 Went out, 2,110 of 3,93,150, " " .. 186 "
 Entered at Chitpore, 562 of 1,26,250, " " .. 225 "
 Went out, 484 of 79,775, " " .. 165 "
 Entered and went out at Chitpore, 1,046 by this return.
 274 probable number of Boats under 25 maunds.
 1,320

No. 448. d.

D.

Register of the Opening and Shutting of the Lock-Gates, from 1st August 1835 to the 1st March 1837.

Date.	River Gates.	Court Gates.	
1st August, 1835, ..	Shut,		
2nd. " ..	" ..	Open.	7 } To scour out the mouth of the Canal.
9th. " ..	" ..	Shut.	
14th. " ..	" ..	Open.	
25th. " ..	" ..	Shut.	9 } *Ditto, Ditto.
31st. " ..	" ..	Open.	
22nd September, ..	" ..	Shut.	
28th. " ..	" ..	Open.	22 } Ditto, Ditto.
6th October, ..	" ..	Shut.	
16th. " ..	" ..	Open.	
20th. " ..	" ..	Shut.	8 } Ditto, Ditto.
28th. " ..	" ..	Open.	
6th November, ..	" ..	Shut.	
12th. " ..	Open,	4	} They were shut two nights during this period.
20th. " ..	Shut,	9	
28th. " ..	Open,	8	
6th December, ..	Shut,	23	
12th. " ..	Open,	56	
20th. " ..	Shut,	16	
28th. " ..	Open,	9	
6th January 1836, ..	Shut,	9	
12th. " ..	Open,	3	
20th. " ..	Shut,	9	
28th. " ..	Open,	9	} The tides were too high.
6th February, ..	Shut,	7	
12th. " ..	Open,	7	
20th. " ..	Shut,	7	
28th. " ..	Open,	7	
6th March, ..	Shut,	4	
12th. " ..	Open,	9	
20th. " ..	Shut,	4	
28th. " ..	Open,	4	
6th April, ..	Shut,	4	
12th. " ..	Open,	23	} In this year the River Gates were open, days 143 And the Canal Gates, 111
20th. " ..	Shut,	3	
28th. " ..	Open,	5	
6th May, ..	Shut,	5	
12th. " ..	Open,	6	
20th. " ..	Shut,	17	
28th. " ..	Open,	26	
6th June, ..	Shut,	12	
12th. " ..	Open,	11	
20th. " ..	Shut,	33	
28th. " ..	Open,	13	} During this time the River was uncommonly high, but every three or four days the River Gates were open for a day.
6th July, ..	Shut,	17	
12th. " ..	Open,	26	
20th. " ..	Shut,	11	
28th. " ..	Open,	11	} The greatest velocity of the current happened on this 7th February, being 85 inches per second, the height of the tide was + 4.2.
6th August, ..	Shut,	13	
12th. " ..	Open,	17	
20th. " ..	Shut,	17	

No. 448. e.

E.

Table of the calculated velocities of the water in the Circular Canal at various heights of the Tide in the River

Height of Tide.	Calculated		Observed maximum Velocity through the Locks.	
	Mean Velocity in Canal.	Maximum Velocity in Canal.		
	Inches per Second.	Inches per Second.		
1	17	20	49	
2	25	28	61	
3	32	34	61	{ Boats can track against this with difficulty. This Velocity injures the Bank.
4	38	40	75	
5	44	46	..	
6	50	51	..	
7	56	57	..	
8	61	62	133	Gates carried away.
9	67	68	..	
10	72	73	..	

No. 449.

No. 2306.

FROM THE MILITARY BOARD.

TO THE RIGHT HONORABLE GEORGE, LORD AUCKLAND, G.C.B.,

Governor of Bengal.

MY LORD,

Fort William: 29th August, 1837.

We have the honor to acknowledge the receipt of Secretary Mr. Mangles' Letter, No. 636, of the 9th May last, enclosing copy of a

The Board submit a report on Eastern and Circular Canals. Dispatch dated 18th January 1837, from the Honorable

Court of Directors, and calling on us for a Report on the subject of the Eastern and Circular Canals, with special reference to certain points adverted to by the Honorable Court, and to which your Lordship has been pleased more particularly to direct our attention.

2nd. We conclude that, the information before the Court on the subject of these Canals, reached to the beginning of 1834. We observe that, since that period, general information on the same subject has been laid before Government in our Annual Reports for 1834 and 1836, paras. 18 to 21 in the former, and 8 to 15 in the latter respectively. The tenor of the information therein contained will, we trust, be satisfactory to Government.

3rd. We are happy in being able to state that, the Lock at Chitpore has fully answered the end of its construction, and a report from the Superintendent of Canals of a date so recent as the 8th ultimo, enables us to quote his opinion of the general efficiency of the structure—

"The most perfect confidence may be placed in the stability of the masonry of the Locks."

4th. We embrace this opportunity of mentioning that, the component parts of a Log or Sleeper Dam were provided about a year since, and are kept constantly in readiness at the Chitpore Locks as a precaution, which in the event of accident occurring to the Gates, or the necessity arising of making sudden repairs to them, might be found extremely useful.

5th. The limits of rise and fall in the Hooghly, beyond which an effect injurious to the Banks [is] produced, have been ascertained, and the Overseer at the Chitpore Locks is directed to close the River-gates whenever the tide in the Hooghly is expected to rise to a certain point, the height of which varies with different seasons of the year. When the Tide does not rise to this limit, the Gates are kept lashed back.

6th. The obstruction to navigation produced by the Lock is inconsiderable, the returns showing no material difference in the number or burthen of Boats that pass through the Locks whether the Gates are open or shut.

7th. The greatest number of Boats that has yet passed through the Locks in any one day when the gates were shut, was on the 24th March, when 130 Boats were Locked through. On this occasion 104 Boats passed out of the Canal, [and] 26 into it: the Lock was filled and emptied 65 times, and the establishment was kept at work 14 hours. Should the traffic, passing through the Canal, demand increased facilities of passage, the Superintendent considers that, with a relief of men to work the Gates and allowing Boats to pass throughout the 24 hours, 250 might be Locked through in a day.

8th. It is not the less a convenience to Boats passing through the Canals to keep the Gates open, whenever the relative levels of the River and Lake permit this to be done.

9th. On the exact degree of effect the current possesses, in washing out the silt from the Canal into the Lake, we do not feel ourselves in possession of data sufficiently clear and conclusive, to be able to speak with confidence. Captain Thomson estimates it at 150,000 cubic feet in 1835-36, but of the benefit that arises from the current in more equally distributing the deposit over the whole bottom of the Canal, there can be no question, indeed it is worthy of consideration, whether any considerable deposit could permanently co-exist with such a current.

10th. Captain Thomson states that, in October 1835, the least depth of water in the Circular Canal was one foot eight inches (understood as applicable to particular spots only), and in June 1836, during the interval between which periods the Gates had been kept open 139 days, the least depth was 5 feet 8 inches. To effect this deepening, 30,000 cubic feet had been removed by dredging, and 150,000 cubic feet had, the Superintendent calculates, been swept away by the current. In October 1836, the least depth of the Canal was found to be 5 feet 2 inches, and in June 1837, it had deepened to 5 feet 11 inches: no dredging having taken place between the two dates last quoted.

11th. In giving these depths, the Superintendent adverts to the irregular manner in which the mud was spread over the surface of the bed of the Canal, and which has prevented the exact quantity of deposit being ascertained, he calculates however, that a deposit to the extent of 200,000 cubic feet still remains in the Canal, of which 80,000 has been brought in since June 1836.

12th. These facts, as far as they tend to show the extent of injury these Canals are likely to sustain from the deposit of silt, are, we consider, satisfactory; the original depth to which the Circular Canal was excavated was 7 feet, but little expence has been incurred or labor bestowed in dredging this Canal during the last three years, and since September last, the dredging has altogether ceased, still the shallowest part of the Canal is 5 feet 11 inches in depth, and we proceed to show that, in one portion of the line, the depth has considerably increased.

13th. As a proof of the effect of the current admitted into the Canal from the River in removing obstructions from the bed, we quote the report recently received from the Superin-

tendent, to which we have already referred, showing the effect produced at the entrance from the River Hoogly to the Canal, a point where the force of the current must always be greatest, but from which its probable influence on the rest of the line may, to a certain extent, be estimated. "The Canal Basin, 150 feet East of the Lock, continues to be "deepened in a regular manner about 1 foot 3 inches a year. The greatest depth is "now 19 feet 4 inches, 250 feet from the Locks, the bottom sloping 9 feet 8 inches in that "distance: at Barrackpore Bridge the depth has increased 6 inches on the West as well as "on the East side, and on the East side of the Dum-Dum Bridge has been deepened 1 foot "6 inches beyond what the Canal was excavated."

14th. The Barrackpore Bridge here adverted to, is about 2,000 feet East of the Chitpore Locks, and the Dum-Dum Bridge 1,250 feet further to the Eastward, and the effect of the current which has been so clearly and forcibly developed at this distance from the River 3,250 feet, as to deepen the bed eighteen inches, must doubtless have had considerable influence along the whole line, though in a constantly diminishing ratio, as the distance from the River increases, and we may, judging from this fact, confidently trust, that the power possessed by the Superintendent of regulating the admission of the current will, if judiciously exerted, continue to have the most favorable effect in keeping the current free from obstruction.

15th. The facts above detailed, afford, we think, sufficient grounds for believing that, not only have exaggerated apprehensions been entertained in some quarters regarding the degree of deposit which was likely to take place in these Canals, from the Calcutta Drains flowing into them, but that the scouring effect likely to be produced from passing a current through the Canal has been greatly undervalued.

16th. It has been represented to us that, a much smaller quantity of silt was brought into the Canal last year than may generally be expected, owing to the small quantity of rain that fell during the season, the statement is probably correct, and under any circumstances, we would gladly adopt any measures, which, without involving an expence incommensurate with the object to be gained, would tend altogether to obviate, if possible, at a reasonable expence, the disadvantage to which this Canal, received [viewed] solely as a line of navigation, must always in a great or less degree be exposed, so long as the Drainage of the Town of Calcutta passes into it.

17th. Under this impression, we have encouraged the submission of any project which seemed likely to attain this desirable end, and we shall notice those that seem the best calculated to effect this object.

18th. Another measure for keeping the Canal free from the silt brought down by the Calcutta Drains has been adopted in the construction of a Cess-pool at the head of the Entallee Canal, the point of discharge of one of the largest Calcutta Drains. The Drain water is thus made to stagnate before it passes into the Canal, and much of the suspended matter is deposited. The Cess-pool has thus been two or three times filled, and the silt which must otherwise have found its way into the Canal, has been excavated and removed by hand labor at a smaller expence, and with less public inconvenience than would attend the more frequent closing of this portion of the Canal for the purpose of excavation.

19th. The condition of the Canal, at which this Cess-pool has been constructed, differs from that of any other portion of this line, it being a *coul-de-sac* devoid of any current passing through it, and the Cess-pool having been formed simply by cutting off a portion of the head of the Canal, by a Retaining Wall and Overfall. Less comparative advantage would perhaps be gained by the construction of Cess-pools at the head of Drains discharging themselves at right angles into a stream of running water, which would be the condition of Cess-pools constructed on the Banks of the Circular Canal, and their construction would certainly be more expensive than in the case before adverted to.

20th. Our efforts to provide the Superintendent with Dredging Vessels have not been successful, a small one repaired by him was destroyed on the first day it was used; an iron one recommended by us has been procrastinated in its completion.

21st. The general state of the Circular Canal appears to us not the less satisfactory, although there has never yet been an efficient Dredging machine in activity in it, and no machine whatever has been at work for several months past. We are therefore induced to believe that, if supplied with the means of rapidity in removing any deposit of more than usual tenacity or of slightly disturbing the surface of the bed of the Canal, at the time of the admission of brisk current, the Superintendent would be enabled to maintain the Canal at a sufficient depth for every purpose of navigation, without devising any other means for removing the deposit; and until this system shall have been fairly tried, we are unwilling to recommend that, other measures shall be pursued.

22nd. The Superintendent of Canals is perfectly aware of our anxiety to place in his hands the means of effectually dredging these Canals, and some months since, we submitted to Government a project for constructing an Iron Boat in this Country, for the reception of the Steam Dredging Machinery. Before however, giving their sanction to the scheme, it was judged necessary to call for further information, which has led to delay, not at the time anticipated; an estimate for carrying this proposition into effect has again been submitted to Government.

23rd. We have also called on Captain Thompson, for an estimate for building a Boat to receive the Hand-dredging Machinery.

24th. We attach great importance to possessing efficient machines for Dredging the Circular and other Canals, as their employment precludes the necessity of closing the Canal for excavation, a proceeding extremely inconvenient to the traffic of Calcutta, and one which necessarily occasions a falling off in the amount of Tolls levied.

25th. The probable expence of keeping the Circular and Balliaghatta Canals, free from silt by the employment of Dredging machinery, was estimated by Captain Thomson, in a report dated 6th June, 1836, at 8,000 Rs. per annum, supposing the Chitpore Lock-Gates were kept open whenever practicable, the probable expence being thus divided—

Circular Canal,	..	..	..	..	..	3,500
Balliaghatta Canal,	..	..	..	..	..	2,000

Total cost of Dredging,.. .. 5,500

Add establishment of Dredging Boat and interest on capital, 2,500

Grand Total, 8,000

or an annual outlay of about 5,100 Rs. for Dredging the Circular, and 2,900 Rs. for Dredging the Balliaghatta Canal.

26th. Under these circumstances, we consider it absolutely necessary that the Superintendent of Canals should have an efficient Dredging Vessel at his command; if not employed in the Balliaghatta or Circular Canals, the lines of navigation in Tolly's Nullah and the Soonderbuns would always afford ample exercise for her powers. If therefore the above estimate is to be depended on, the annual saving from turning the discharge from the Calcutta Drains away from the Canal, would be Rs. 3,500 less the expence of repairing and maintaining any work or system of works divided with that view, and on these principles, the pecuniary advantage of any scheme which may be proposed for effecting the object can be readily determined.

27th. We forward herewith, an abstract showing the total expence that has been incurred in Dredging the Canals during the last three years, the proportion of which charge-

able to the Circular Canal, amounts to Rs. 4,923. There has been altogether 24,647 Rs. laid out during the above period, on this amount of which an expence of 17,104 Rs. was incurred on account of the Steam Dredging Vessel.

28th. This vessel was repaired and set to work on the Canals, but her heavy draught of water and great bulk, quite unfitted her for employment in narrow Channels like the Canals, and the expence of her maintenance and establishment was altogether disproportionate to the amount of work she performed: after keeping the vessel two years, during which period dredging was actually carried on for a period of barely 6 months, the hull was condemned as unworthy of further repair, and has since been broken up, since then a sum amounting to nearly 2,000 Rs. has been laid out in repairing an old and infirm Hand-dredging Boat, which failed the first day it was attempted to set her to work.

29th. We regret having to give this very unfavorable account of our attempt to place the means of efficiently Dredging the Canals at the Superintendent's disposal, the vessels adverted to, were however, Government property, and the establishment attached to the Steam Dredging Boat, had been kept up for some years without making any corresponding return to Government. The vessels were therefore transferred to the Superintendent of Canals at his request, as, in his hands, the best chances existed of making them really useful to Government, failing in which, the establishment of the Steam Dredger has been discharged, and machinery, which is understood to be in excellent order, laid up till an efficient Boat, and adapted to the localities in which her service is required, can be built to receive it.

30th. The Hand-dredging Boat to which we have adverted, has been repaired again, but has not again been set to work, the hull is worn out, and it is only in the absence of a more efficient machine that the Superintendent will have recourse to the imperfect aid this Boat may be able to afford.

31st. We are assured by the Chief Magistrate of the Town of Calcutta, that in no quarter whatever have any complaints been preferred of injury to the wholesomeness of the water of the Hooghly, having resulted from the construction of the Circular Canal, and we have received none. The notion that such injury might result was broached by the opponents of the Canal. The supposition that a large body of salt water would flow through the Canal into the River, was quite gratuitous of the fact that the projecting point of land of Hathkollah would throw the supposed offensive water into the middle of the stream.

32nd. The relative levels of the River and the Lake show that the true ground of apprehension should have been, not that the River would become salt, but that the Lake would become fresh.

33rd. We have thus endeavoured to answer the questions proposed to us, the Tables attached to this Report will tend more clearly to illustrate the capability of the Chitpore Locks, and the perfect safety with which, under certain precautions, they may be thrown open for the free admission of the waters of the Hooghly. These Tables have been furnished to us by the Superintendent of Canals.

We have, &c.,

(Signed)	D. McLEOD, Colonel, Chief Engineer.
„	D. McFARLAN, Chief Magistrate, M. M. B.
„	A. IRVINE, Major, M. M. B.
„	T. M. TAYLOR, Major, M. M. B.

No. 449. a.

Abstract showing the Total expences connected in the Dredging the Calcutta Canals taken from the accounts furnished by the Superintendent, from the 1st May 1834 to the 1st May 1837, exhibiting as nearly as possible, what proportion is to be debited to the Circular Canal.

Bill Book and Number.	Months	How employed.	Account of Steam Dredger.					Mud Boat account.	Wreck Boat account.	Hand-dredging Boat account.	Charges for excavation.		Grand Total.
			The Engineer Mr. Stewart's	Estab- lish- ments.	Contingent charges.	Repairs.	Breaking up.				Ballesghatta Canal.	Circular Canal.	
461 H. of 1834-35. & 395	May, 1834.	..	..	100 5 2	14 10 1	..	..	..	..	..	..	..	Rs. A. P.
462	June, ..	Under repair.	365 12 3	100 5 2	10 8 11	99 12 0	..	..	..	..	..	..
463	July, ..	..	365 12 3	100 5 2	453 2 1	..	..	..	..	..	..	..
464	August, ..	..	365 12 3	100 5 2	130 4 3	..	..	..	..	..	..	..
465	September, ..	..	365 12 3	100 5 2	..	61 13 1	..	..	..	..	..	..
466	October, ..	..	365 12 3	100 5 2	4 2 11	..	..	..	..	..	..	..
467	November, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
468	December, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
469	January, 1835, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
1,167	February, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
1,168	March, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
1,169	April, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
72 H. of 1835-36. & 465	May, ..	..	365 12 3	100 5 2	..	..	..	..	..	..	..	..
148	June, ..	Comd. B.C. 10th July.	365 12 3	100 5 2	..	1,712 9 10	..	..	..	..	490 0 10	..	
149	July, ..	Ballesghatta Canal stopped 25th.	365 12 3	100 5 2	..	..	..	..	..	..	..	..
537	August, ..	Ballesghatta Canal stopped work.	365 12 3	100 5 2	..	..	..	..	..	..	406 8 1	..	
617	September, ..	Ballesghatta Canal.	365 12 3	100 5 2	..	..	..	..	..	..	179 2 4	..	
749	October, ..	..	365 12 3	107 2 8	..	..	..	..	..	..	474 13 6	..	
752	November, ..	..	365 12 3	111 0 0	..	..	..	..	..	..	468 5 5	..	
890	December, ..	..	365 12 3	111 0 0	..	..	..	..	..	..	168 12 3	165 12 3	
986 H. 141 E.	January, 1836, ..	Circular Canal.	365 12 3	111 0 0	50 13 8	..	..	..	..	..	..	..
1,196	February, ..	12 do. Lake Canal.	365 12 3	95 0 0	..	..	..	..	..	..	..	..
1,253	March, ..	12 do. Lake Canal.	365 12 3	95 0 0	..	..	..	..	..	..	..	..
91 H. of 1836-37. & 465	April, ..	States the Dredging.	365 12 3	95 0 0	..	..	..	..	..	..	136 6 7	136 6 7	
354	May, ..	No Dredging.	365 12 3	80 0 0	..	..	..	..	..	..	..	..
358	June, ..	..	365 12 3	80 0 0	47 0 0	140 11 7	..	..	..	..	..	..
367	July, ..	Unserviceable.	365 12 3	116 0 0	..	..	..	..	..	..	..	..
972	August, ..	..	365 12 3	116 0 0	..	..	..	..	..	..	..	..
738	September, ..	..	365 12 3	80 0 0	..	..	..	..	..	..	..	..
835	October, ..	..	365 12 3	80 0 0	..	..	..	..	..	..	..	..
1,168	November, ..	Breaking up.	152 12 1	80 0 0	..	..	153 11 0	..	..	..	..	..
1,169	December, ..	..	0 0 0	0 0 0	..	..	..	..	..	..	..	..
1,170	January, 1837, ..	..	0 0 0	0 0 0	..	..	..	..	..	..	..	..
1,378	February, ..	..	0 0 0	0 0 0	..	..	..	..	..	..	..	..
1,396	March, ..	..	0 0 0	0 0 0	..	..	..	..	..	..	..	..
1,415	April, ..	..	0 0 0	0 0 0	..	..	..	..	..	..	..	..
Total amount Co's. Rs. ..			10,790 1 4	3,098 15 8	744 12 10	2,014 13 8	454 15 11	2,674 12	3,247 16	11,591 2	4,324 1	0 305 2	10 2,464 10 4

* 17,103 11 5

* This sum is to be proportionably chargeable on the excavation of the Ballesghatta and Circular Canals, viz. 112½ Chowkas of earth excavated on the Circular Canal, and 304½ Chowkas on the Ballesghatta Canal and Taba Canal

The following Statement shows the quantity of earth excavated by the Steam Dredger.

As per Quarterly Progress Report, dated 1st Oct. 1835, from 10th July to 25th Augt. 1835.

29 days employed on the Balleaghatta Canal.

3500 Tons, equal to $116\frac{2}{3}$ Chowkas of earth excavated.

Ditto ditto, 1st January 1836, number of days not mentioned, ditto on ditto 150 ditto ditto.

Ditto ditto, 1st April, 1836. $\left\{ \begin{array}{l} \text{From 1st Jan. to 5th Feb. 1831, 36} \\ \text{days, ditto on the Circular Canal,} \\ \text{In March 1836, 12 ditto ditto on} \\ \text{the Lake Canal,} \end{array} \right. \quad \begin{array}{l} \text{Chowka } 112\frac{1}{2} \text{ ditto ditto.} \\ 150 \text{ by } 37\frac{1}{2} \text{ ditto ditto.} \end{array}$

Total, .. $416\frac{2}{3}$ Chowkas.

Balleaghatta Canal, 266 $\frac{2}{3}$

Lake Canal, 37 $\frac{1}{2}$

Circular Canal, 112 $\frac{1}{2}$

304 $\frac{1}{6}$

112 $\frac{1}{2}$

416 $\frac{2}{3}$ Chowkas.

General abstract of the expences chargeable proportionably on the Balleaghatta and Circular Canals.

	Balleaghatta Canal & Lake Channel.	Circular Canal.	Making up and repairing Mud Boats.	Wreck Boat account.	Grand Total.
Expences for excavation,	2,324 1 0	305 2 10			
Proportion of Engineer's Salary, Establishments, Contingencies, Breaking up, &c. of the Steam Dredger, Rs. 1,17,103-11-5,	12,485 11 4 $\frac{1}{2}$	1,618 0 0 $\frac{1}{2}$			
Hand-Dredging account,	14,809 12 4 $\frac{1}{2}$ 1,991 2 4	4,923 2 10 $\frac{1}{2}$			
Total account, Co's. Rs.	16,800 14 8 $\frac{1}{2}$	4,923 2 10 $\frac{1}{2}$	2,674 12 3	247 12 6	24,616 10 4

(Signed) EDWD. SANDERS,

Secretary Military Board.

(No. 450 to No. 466 inclusive, omitted.)

No. 467.

No. 109.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 8th November, 1847.

SIR,

The 12 months that the collection of the Canal Tolls have been in my charge being now completed, it is necessary that I should report on the occurrences of the past half year. In drawing up this report I have adopted the same form of statement that was attached to my letter No. 1, of the 4th of May last.

2. Statement A. shows a net collection of 66,000 Rupees, this is 9,000 Rupees short of the 75,000 Rupees that I anticipated in the 11th para. of my letter of the 4th May last. The average of many years of the collection in Tolly's Nullah has shown that the produce of the half year ending on the 1st of May, is to that of the half year ending 1st November,

in the proportion of 12 to 7, and in making the foregoing estimate this proportion was adopted for that Nullah, the proportion for the past year has been as 12 to 6 nearly. There were no returns of the collections in the Balliaghatta Canal that the slightest dependance could be placed on, and I could therefore make no estimate of the probable collection; the estimated amount was 40,000, the sum collected 34,000, but as the Boats are giving a preference to the Circular Canal over Tolly's Nullah, the deficiency in the collection of the latter should be deducted from the former, and making on both lines of Canal, the sum collected in the half year ending 1st of May to that ending on the 1st November, in the proportion of 100 to 65.

3. In reviewing the collection for the whole of the past year I am of opinion, that the amount collected is rather greater than what the average future collections will be. The following kinds of Boats and articles were imported in excess of the usual quantities, namely, passenger Boats, rafts of teak planks, and rice: I might include also lime and bamboos. On the other hand, the South-west monsoon has been very severe in the Sunderbunds, and the number of Boats wrecked in the Roymungul and the Attarabanka, has exceeded any former experience: the amount of the loss may have exceeded 2 lacs of Rupees in the months of May and June last, and the traffic by all large loaded Boats was stopt for a time. Some of the loaded Boats attempted to come through the Sunderbund Canal, but grounded and went to pieces in the Chultabarya Canal, not only obstructing it for a time, but deterring others from attempting this safer passage.

4. Numerous frauds by the Toll Darogahs have been detected by me during the past half year, and the parties discharged with the loss of the pay due to them at the time; but while they have defrauded in the course of the year to the amount of probably 4 or 5,000 Rupees, the trifling loss of pay due to them has been of little consequence, and I now regret that the power of fining the Darogahs was not granted to me, as had been recommended by the Canal Committee, this cannot now be remedied, and I can only suggest, that a better class of men be got by increasing their pay: with this object in view, I have now to recommend to the Military Board, the expediency of increasing the pay of the Darogah of the Dhapa Chowkey from 80 to 100 Rs. a month, and the Kidderpore Darogah from 60 to 75. I have not been able to devise any plan better than the system of tickets originally adopted to detect frauds, but it shows when speculation exists at a particular Chowkee, and I can then use other means to bring to light the particular cases of it.

5. My opinion formed on one year's experience of the working of the Canal, Act XXII. of 1836 is so far favourable, that I can suggest no alteration that holds out a prospect of improvement with the exception of a reduction of the measurement of the Boats of about 15 per cent. The real burthen of the smaller Boats is less than the measured burthen by about that proportion. This is considered as a grievance, and when the attention of those complaining was called to the rule under the former Act, they stated, and I believe correctly, that the former measurement was very seldom enforced on small Boats, but the threat was used to extort a fee. I have measured a great many Boats, and have arrived at the conclusion, that the same system still exists, but not to the same extent by the Boats being generally undermeasured 15 per cent., if the reduction in the mode of measurement was authorized, I would make the same collection as I now do, because I could enforce a strict attention to the rule without any apparent hardship, or causing any complaints.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October, 1837.

Calcutta: 1st November, 1837.

Toll Houses.	May, 1837.	June, 1837.	July, 1837.	August, 1837.	September, 1837.	October, 1837.	Total.	Remarks.
Panspotah, ...	3,639 3 6	3,775 6 0	3,376 5 0	3,369 4 6	3,210 1 6	4,264 6 6	2,1634 11 0	Gross Collec- tion 1st half } 1,07,771 8 8
Tolly's Nullah. {								year. ..
Kidderpore, ...	2,078 6 0	1,886 2 0	1,568 1 6	1,875 14 0	1,831 15 6	2,071 0 0	11,311 7 0	Ditto 2nd ditto, 69,287 10 4
Circular { Dhapa, ...	3,160 7 6	3,255 6 6	4,012 15 0	3,153 13 0	4,245 4 0	11,562 8 0	29,390 6 0	Total, ... 1,77,059 3 0
Canal. { Chitpore, ...	834 2 0	874 2 6	1,496 7 0	1,136 3 0	1,139 5 6	1,179 9 6	6,659 13 6	Deduct Expence, 9,911 4 5
Ferries and Fisheries, ...	47 5 0	48 12 10	48 12 6	48 12 10	48 12 10	48 12 10	291 4 10	Net Collection ending 31st } 1,67,147 14 7
								October 1837, }
Gross Collection, ...	9,759 8 0	9,839 13 10	10,502 9 0	9,583 15 4	10,475 7 4	19,126 4 10	69,287 10 4	
Monthly Expences, ...	402 5 0	914 4 6	544 8 0	544 12 0	547 4 0	544 8 0	3,497 9 6	
Net monthly Collection,	9,357 3 0	8,925 9 4	9,958 1 0	9,039 3 4	9,928 3 4	18,581 12 10	65,790 0 10	

Expenditure over-stated the last half year on Toll Houses and Ghauts,

Six month's net Collection, 548 10 10

J. THOMSON, Captain,
Superintendent of Canals.

Abstract of the Expenditure.

Months.	Establishment.	Contingent charges.	Total.
1837, May,	393 0 0	9 5 0	402 5 0
„ June,	843 0 0	71 4 6	914 4 6
„ July,	543 0 0	1 8 0	544 8 0
„ August,	543 0 0	1 12 0	544 12 0
„ September,	543 0 0	4 4 0	547 4 0
„ October,	543 0 0	1 8 0	544 8 0
			3,497 9 6
Charged as the Cost of Toll House and Ghauts last half year,			3,562 1 9
Actual Cost,			3,013 6 11
Deduct difference,			548 10 10

J. THOMSON, Captain,
Superintendent of Canals.

(No. 468 to No. 470 inclusive, omitted.)

No. 471.

No. 141.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 30th December, 1837.

SIR,

In reply to your letter No 4584, enclosing a letter No. 1799, from the Officiating Secretary to the Government of Bengal, I have the honor to state, that there are no returns or documents in my office which would enable me to give the information required. I will however hazard an opinion, on which as much dependence only may be placed, as my opportunities of observation may enable to form a judgement.

There being no distinction made now between empty and loaded Boats, the class of Boats entirely empty have been much reduced in numbers and will soon disappear, with the exception of a large proportion of the Boats which bring rice to the Calcutta grain market, and Boats employed to remove Coal from Carr, Tagore & Co's. Coal Sheds, but with reference to table C. accompanying my Report No. 1, dated 4th May 1837, the following classification may be made as a comparison between the former regulation and the present, on the supposition, that no charge [? change] has taken place in the mode of conducting the traffic.

What proportion of the Gross Revenue arising from the Tolls has been realized from empty Boats?

	Rs.	From loaded Boats.	From Empty Boats.	Miscellaneous.
Total Collection by former Regulation, 100	75	15	10	
Ditto ditto, by present rate, collected in the former manner, }	100	46	46	8

CCXXX

What amount is collected from empty Firewood Boats only? In general, no Toll has been collected from empty Firewood Boats. The only exception to this is, when a very unhealthy season occurs on the Banks of the Hoogly River, between the 1st April and beginning of December (when the Firewood Boats cannot pass through Channel Creek). Empty Boats may be sent into the Canals to buy Firewood to burn the dead.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 472.

No. 4758.

FROM THE MILITARY BOARD,

TO THE GOVERNMENT OF BENGAL.

5th January, 1838.

Revenue Department.

In pursuance of the instructions conveyed in Secretary Mr. Halliday's Letter No. 1799, of the 19th ultimo, we called on the Superintendent of Canals to furnish the information required, and regret to find that no returns have been kept which would enable that Officer to give specific replies to the questions asked, we beg however to submit in original Captain Thomson's reply* to the call made on him.

Requiring Toll Collection on empty Boats with further observations.

*No. 141, of 30th December, 1837. •

2nd. It is known to Government that all Boats entering the Canal at either end, whether loaded or empty, pay Toll, all Boats again whether loaded or empty pass out of the Canal *free*. Thus the empty Boats passing into the Canal for the purpose of receiving cargo on the line of the Canal, pay Toll on their entrance but pass free with their Burthen returning.

3rd. These are the only empty Boats which pay Toll, excepting those which pass through the Canal from the River Hoogly into the Sunderbuns for the purpose of bringing back firewood; in this case the cargo would be subjected to a double Toll, it is however, we believe, a very same case, and one by no means a measure of necessity for supplying Calcutta with fuel.

4th. The firewood brought from Sunderbuns is chiefly stored near the Circular Canal, and the western entrance of Tolly's Nullah, to these depôts the wood is now brought on the payment of Toll at the rate of one Rupee per hundred maunds for going and returning—the only object therefore the dealer in firewood can have in bringing his goods completely through the Canal into the Hooghly, thereby incurring the liability to pay double Toll, is, that the saving arising from water-carriage by the use of the artificial Channel over the land-carriage for one mile and a half, is more than sufficient to compensate the charge of additional Toll to which the goods are subjected.

5th. Under this view of the case, no greater proof of the value of the Canal to the public could be afforded than the increasing resort to it on these terms.

6th. The present rule—Toll levied on all Boats on entrance, and a free exit to all Boats without exception—is exceedingly simple, and liable to no misapprehensions; on this account

it is especially suited to the class of traders frequenting the Canals, and creates the least possible delay in the collection of the Toll. We beg therefore respectfully, but earnestly, to deprecate any change which may tend to modify the simplicity and general application of the present regulation.

7th. All exemptions or protections to particular classes of Boats have a tendency to cause abuse; evasion or compromise of the Toll become comparatively easy, and a system of connivance on the part of the Toll-keepers arises, which it is almost impossible to detect.

8th. A reference to the Price Current of former years has satisfied us, that no fluctuation in the rate of fuel which can be traced to the influence of the Canal Tolls has been felt in Calcutta, and that it is as cheap at the present time as before the regulation of the 1st November 1836 took place, and we are still of opinion, if in any instance it be thought that relief is wanting, the best mode of granting it is by making the rate of Toll so light on all, that it shall be oppression on none. The amount of relief that would be gained by partial exemption would, we are persuaded, bear no proportion to the loss the public interest would sustain from the abuses to which a deviation from the present universality of the rule would give rise.

We have, &c.,
(Sd.) D. M.
D. M.
A. I.
T. M. T.

(No. 473 to No. 481 inclusive, omitted.)

No. 482.

No. 361.

FROM CAPTAIN H. DEBUDE,

Superintending Engineer, South-Western Provinces,

TO CAPTAIN E. SANDERS,

Secretary Military Board.

Calcutta: 31st May, 1838.

SIR,

I do myself the honor to submit herewith Captain Thomson's Bill No. 57, for making and repairing Towing-paths in the Soonderbund Canals for the year 1837-38.

2nd. Its amount is below the estimate, and I recommend that the Bill be passed.

3rd. I take this opportunity with reference to Captain Thomson's letter No. 204, of the 27th ultimo, and to your reply No. 288, of the 15th instant, to mention that having communicated both personally and by letter with Captain Thomson on the subject of the contract proposed by him, I am enabled to state that Captain Thomson's object in bringing forward this proposition was to remove, by employing the agency of the Grantees, an obstacle to the Navigation of the Canal, which, from the nature of the tenures on which the land is held, can in fact be overcome in no other manner. Captain Thomson assures me, that nothing could have been farther from his intention than to transfer his own duty to others, but simply, as the Grantees objected to the employment of Coolies paid by Captain Thomson, and to the

cutting of jungle, on their ground, to have the work done through the agency of the Grantees themselves.

4th. The extent to which the proposed contract would apply is a little short of 4 miles, near the east extremity of the Canals, in the portion known by the name of the Hinshee and Gobra Khalls, and as the Grantees are entirely masters of their own ground, it will be impossible within these limits to arrange, either for keeping the Towing-paths in order or for removing trees and wrecks, without obtaining not only the Grantees' consent but in cases of removing wrecks their assistance also.

5th. The same objections do not apply to the line of Canal generally, and as Captain Thomson expects to be able to manage in the usual way throughout the remainder of the line, I would earnestly recommend that his proposal be sanctioned as an experiment for the present year.

Should there be any other point connected with this subject regarding which the Board would wish to be informed, I shall be happy to obtain and submit the desired information.

I beg to annex copies of my letter No 236, of the 21st instant, and of Captain Thomson's reply No. 18, of the 23rd instant, on this subject, for the information of the Board.

I have the honor to be,

Sir,

Your most obedient Servant,

H. DEBUDE,

Superintending Engineer, South-Western Provinces.

No. 482. a.

No. 236.

FROM CAPTAIN H. DEBUDE,

Superintending Engineer, South-Western Provinces,

TO CAPTAIN J. THOMSON,

Superintendent of Canals.

Calcutta: 21st May. 1838.

SIR,

With reference to my letter No. 174, of the 17th instant, and to its enclosure, wherein was communicated to you the opinion of the Military Board, on the subject of your letter No. 204, of the 27th ultimo, I do myself the honor to request, that you will mention as near as may be—

1st. What is the total length of Towing-paths on the Soonderbund Canals?

2nd. Whether the whole of these have hitherto been kept in repair for the sum charged in your Bills for 1834-35-36 and 1837, as per margin,* and whether these Bills include the

* For 1834 Rs. 813 7 8 cost of removing the Boats and other obstacles from the Canal?

" 1835 " 842 11 4

" 1836 " 1092 15 6

" 1837 " 773 5 3

3rd. What length of Towing-path and Canal is to be kept in order by the contract to which your letter No. 204, of the

27th ultimo, refers?

4th. What sum you consider sufficient to pay for keeping up Towing-paths and removing obstacles from the Canal, on those parts to which your contract with Mr. Storm does not apply.

5th. What arrangement do you propose for seeing that Mr. Storm or any other contractor acts up to his engagement, and how would you enforce it if he does not?

6th. Why should your Coolies in the Soonderbunds be paid more than those of other people?

2. I do not for a moment suppose that, if you can satisfactorily prove that it is for the public interest to keep the Canal and its paths in order by contract, the Military Board will object to such an arrangement, but you will, I think, on consideration perceive that it was scarcely possible for the Military Board to sanction a change which appears to be based in a great measure on your supposed inability to attend to those duties of supervision and inspection which naturally and immediately devolve on the professional Superintendent of the Canal.

3. You will observe, that the Military Board's letter does not refuse to sanction the contract arrangements under any circumstances, but merely states, that the Board is not in possession of the necessary information to warrant its sanction being now given.

I have, &c.,

(Signed) H. DEBUDE,

Superintending Engineer, South-Western Provinces.

(True Copy)

H. DEBUDE,

Superintending Engineer, South-Western Provinces.

No. 482. b.

No. 18.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

South-Western Provinces.

Sir,

Calcutta: 23rd May, 1838.

I have the honor to reply to the queries contained in your letter No. 236, of the 21st instant, in the order you have stated them.

1st. The length of the Towing-paths on the Sunderbund Canals, which have been made and repaired, has varied from year to year from 18 to 25 miles.

2nd. The repairs done and charged for in the bills quoted were of a partial and temporary nature, and cannot be described as keeping the Towing-paths in order, and with the exception of the season 1836-37 (when I had a wreck Boat), no attempt has been made to remove trees, sunk Boats or other obstructions.

3rd. In my letter No. 204, I proposed that the Towing-paths should be kept in order by contract for a distance of $3\frac{1}{4}$ miles.

4th. No systematic or regular attempt has been hitherto made to keep in order the Tow-paths or remove obstacles from the Sunderbund Canals or Channels, and consequently no Estimate can be made of the cost, but three-fourths of the work (in extent) proposed to be done by contract is new work, not hitherto done, and to make repairs to the remaining part of the line of Canals in the usual way will cost the usual sum of about 800 Rs.

5th. Several hundred Boats pass daily through the Canals, by which I could receive a daily report of the state of the Canals if necessary, and I would not pay the allowance until I was satisfied that the contractor had performed his engagements.

6th. I hire Coolies in the Hazareebaugh district at the customary rate of 4 Rs. a month, but the Coolies employed by the Sunderbund Grantees are resident on the spot, and have houses and other advantages which will account for a difference of rate of pay.

2. In my letter No. 204, I made a proposition for getting some work done by contract, the greater part of which I could not do at all, which enabled me to dispense with a gang

of Coolies hired by the season, and get the work done by the more economical and more efficient method of Coolies hired on the spot. Although this proposition would entail on me much additional trouble, it has not protected me from the suspicion, that I desire to throw my own proper duty on others.

3. The remarks contained in the Military Board's letter, No. 288, on the subject of the collection of the Tolls, requires me to observe, that while the Superintendent of Canals has the charge of the collection of the Tolls, he cannot absent himself from Calcutta for more than four days without neglecting this duty. This was fully understood when the collection of the Tolls was transferred to this department, and provided against by a recommendation that the Tolls be farmed in November 1837; this recommendation has not been acted on, but will no doubt be so whenever the necessity becomes urgent.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 483.

No. 1035.

FROM THE SECRETARY MILITARY BOARD,

TO THE SUPERINTENDING ENGINEER,

South-Western Provinces.

SIR,

26th June, 1838.

I am directed by the Military Board to acquaint you, that the undermentioned Bill has been this day passed, and sent to the Accountant General for adjustment.

(Enter Bill No. 28 H. of 1838-39.)

With reference to the question of entering into a contract with the Agent of a Soonderbund Grantee for the maintenance and repair of part of the Soonderbund Tracking-paths, I am directed by the Military Board, under your strong recommendation, to express their acquiescence to the proposed arrangement, and to request you will accordingly direct Captain Thomson to enter into the necessary contract for one year.

But the Board are of opinion, that if the question be closely looked into, it may be found that Government have a right to the Tow-path along the Soonderbund line, if such should prove not to be the case, and if any difficulty is found in acquiring the ground by purchase, the necessary steps should be taken, under existing regulations, to procure it for the use of the public.

I am, &c.,

E. SANDERS,

Secretary Military Board.

(No. 484 to No. 513 inclusive, omitted.)

No. 514.

No. 127.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 19th November, 1838.

I have the honor to forward returns A, B, C, D, E, F, of the Tolls collected on the Canals during the past half-year, ending 31st October 1838, the rates of Tolls having been reduced one-half during the last half-year. I have entered the half of the Collections made during the half-year ending 31st October 1837, for the sake of comparison.

2nd. With respect to the comparative Statement D, in May 1837, the wind was remarkably boisterous and destructive to Boats navigating the Sunderbund Channels. But in May 1838, the weather was as favorable as usual, and the consequence was an increase in the amount of Toll for that month of 1,583 Rs., and by referring to the number of Boats in Table F, it would appear that in May 1837, 400 Boats of the average burthen of 800 maunds each, were wrecked in the Attrabanka and Roymungul, valuing these Boats at 1/8 each maund, including Cargoes of grain and seeds, the estimated loss was about 4,50,000. The natives estimated the loss at 6 lacs. I stated in my report No. 109, of the 8th November 1837, that the loss was probably 2 lacs.

3rd. In 1837 the Bhagruttee became closed in September, which accounts for the excess of 4,600 Rupees in the former over the latter year.

4th. The decrease in the amount of Collections of about 4,600 Rupees during the last half-year, in comparison with the former half-year, is not to be attributed wholly to the cause mentioned in the foregoing paragraph; by referring to statement F, it will be observed, that the number of Boats paying Toll have been gradually decreasing in number for a reason anticipated in my former reports, namely, that as the Toll on empty and loaded Boats have been equalized, Boat proprietors have been getting into the practice of loading their Boats on both trips, coming and going; and it will be further observed, that there is a great increase in the number of small Boats less than 25 maunds burden, which pay no Toll, these Boats now carry to the whole of the bazars on the banks of the Canal the daily supplies of perishable articles. I also have to remark, that a large quantity of grain usually brought to Calcutta from the Eastward through the Canals has been sent to the Upper Provinces by the Ganges.

5th. From the foregoing reasons I am of opinion, that the net Collection during the past half-year of 28,210 Rs. is about 2,500 less than the average, and that the estimate for the next half-year's net Collection will be also less than the average, and will amount to about 42,000 Rs.

6th. The conduct of the Toll Darogahs has not been more satisfactory this half-year than any of the preceding. The principal fault they are guilty of is, that of neglect in permitting during the night, Boats to pass out without returning their tickets, and paying the rent due upon them. The rent on Boats being of the nature of a fine to prevent the Canals being over-crowded with Boats, and as the effect of this rent-charge, as it is now administered, is sufficient for the intended purpose, no direct or material injury is sustained by the neglect of the Darogahs, but it no doubt allows of speculation by the manjees with the connivance of the Darogahs, which I do not at present see how it can be avoided except by punishing the parties when they are detected.

I have the honor to be,

Sir,

Your most obedient Servant,

(Signed) J. THOMSON,

Superintendent of Canals.

No. 514. a.

A.

Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October, 1838.

Calcutta: 1st November, 1838.

	May, 1838.	June, 1838.	July, 1838.	August, 1838.	September, 1838.	October, 1838.	Total.	
Tolly's { Pauspotah, ..	1,630 6 6	1,332 2 9	1,432 0 3	1,598 4 0	1,302 4 9	1,673 10 3	8,968 12 6	
Nullah. { Kidderpore, ..	672 1 6	781 0 0	845 6 6	1,003 4 2	720 15 9	908 1 9	4,930 13 8	
Circular { Dhapa, ..	3,457 11 6	2,275 9 3	2,173 8 0	1,865 1 3	1,940 4 0	2,530 14 9	14,243 0 9	
Canal. { Chitpore, ..	679 4 6	584 5 0	525 6 0	538 11 0	505 14 0	533 14 9	3,367 7 3	
Ferries and Fisheries, ..	48 12 10	48 12 10	48 12 10	48 12 10	31 11 6	39 12 6	266 11 4	
Gross Collection, ..	6,488 4 10	5,021 13 10	5,025 1 7	5,054 1 3	4,501 2 0	5,686 6 0	31,776 13 6	Gross Collection for the half-year, return B.
Monthly Expence, ..	579 8 0	579 8 0	681 4 0	575 8 0	575 8 0	575 8 0	3,566 12 0	Expence of establishment for ditto, return C.
Net monthly Collection,	5,908 12 10	4,442 5 10	4,343 13 7	4,478 9 3	3,925 10 0	5,110 14 0	28,210 1 6	Net Collection for ditto.

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 514. b.

B.

*Explanation of the Receipt and Expenditure in the Toll Collection Account, for the half-year ending 31st October, 1838.**Calcutta : 1st November, 1838.*

May, 1838,	6,504	0	10
June,	5,021	13	10
July,	5,652	9	7
August,	5,069	13	3
September,	4,501	2	0
October,	5,726	6	0
	<hr/>		
Deduct Circular Canal Ground-rent,	32,475	13	6
	699	0	0
	<hr/>		
Gross Collection,	31,776	13	6

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 514. c.

C.

*Amount of Current Expence Bills in Toll Collection Account, for the half-year ending 31st October, 1838.**Calcutta : 1st November, 1838.*

	Establishment.	Contingent Expence.	Total.	Remarks.
May, 1838,	655 0 0	1 8 0	656 8 0	
June.	655 0 0	1 8 0	656 8 0	
July,	655 0 0	103 4 0	758 4 0	101/12 expended in the repair of Pauspotah Toll- House which had been unroofed by storm.
August,	651 0 0	1 8 0	652 8 0	
September,	651 0 0	1 8 0	652 8 0	
October,	651 0 0	1 8 0	652 8 0	
	3,913 0 0	110 12 0	4,028 12 0	
Deduct Conservancy Establishment,			462 0 0	
Half-yearly expence of Toll Collection.			3,566 12 0	

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 514. d.

D.

Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half-years commencing 1st May, 1837-38.

Calcutta: 1st November, 1838.

	One-half of 1837.	1838	Increase.	Decrease.
May, ..	4,856 1 6	6,439 8 0	1,583 6 6	
June, ..	4,895 8 6	4,973 1 0	77 8 6	
July, ..	5,226 14 3	4,976 4 9 ..	..	250 9 6
August, ..	4,767 9 3	5,005 4 5	237 11 2	
September, ..	5,213 5 3	4,469 6 6 ..	..	743 14 9
October, ..	9,538 12 0	5,646 9 6 ..	..	3,892 2 6
			1,898 10 2	4,886 10 9
	34,498 2 9	31,510 2 2 ..	..	2,988 0 7

(Signed)

J. THOMSON, Captain,
Superintendent of Canals.

No. 514. e.

E.

Comparative Statement of the Collections, exclusive of Ferries, made at the different Toll-houses, in the half-year commencing —

Calcutta: 1st November, 1838.

	One-half of 1837-38.	1838-39.	Increase.	Decrease.
Tolly's Nullah. { Pauspotah,	10,817 5 6	8,968 12 6	.. ..	1,848 9 0
{ Kidderpore,	5,655 11 6	4,930 13 8	.. ..	724 13 10
Circular Canal. { Dhapa,	14,695 3 0	14,243 0 9	.. ..	452 2 3
{ Chitpore,	3,329 14 9	3,367 7 3	37 8 6	
			37 8 6	3,025 9 1
	34,498 2 9	31,510 2 2	.. ..	2,988 0 7

(Signed)

J. THOMSON, Captain,
Superintendent of Canals.

No. 514. *f*.

F.

Comparative Statement of the number of Boats passing through the Canals for 4 months, ending the 31st October, 1837-38.

Months.	1837.		1838.		Increase.		Decrease.	
	Boats paying Toll.	Small Boats.	Boats paying Toll.	Small Boats.	Boats paying Toll.	Small Boats.	Boats paying Toll.	Small Boats.
July, ..	4455	1333	4864	1688	409	355		
August, .	5057	1109	4589	1531	. .	422	468	
September, .	6405	1093	5371	1556	. .	463	1034	
October, ..	7456	951	5313	1540	. .	589	2143	
					409	1829	5645	
Total, ..	23373	4486	20137	6315	. .	1829	3236	

(Signed) J. THOMSON, Captain,
Superintendent of Canals

(True Copies.)

H. DEBUDE,

Officiating Secretary Military Board

(No. 515 to No. 522 inclusive, omitted.)

No. 522. *a*.

No. 154.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE OFFICIATING SUPERINTENDING ENGINEER,

South-Western Provinces.

Calcutta: 10th January, 1839.

SIR,

I have the honor to forward to you a copy of a letter received this morning from the Secretary to the Military Board, and to report to you for their information, that it is my custom to remove all sunk Boats immediately after accidents occur, if it is in my power to do so. The Boats referred to in the Military Board's letter, sunk many months ago, and could not be removed at the time; they must therefore be broken up and removed piece-meal, when the lowness of the tides will allow of this being done, and when I can command workmen on

* Estimate No 287
B 1838-9

the spot, which will be sometimes between the 15th of January and 25th of February, if my estimate No. 3,* dated 17th December, 1838, for removing the earth from the Lake Channel, &c. is passed previous to this time.

2nd. The 2nd paragraph of the Military Board's letter refers, I understand, to the removal of obstructions from the Sunderbund Canals. Beyond the establishments for the Calcutta Canals, I have no means of carrying into effect the order to remove any obstructions from the Canals, and these men cannot be sent away from their other duties to a greater distance than 5 or 6 miles.

3rd. On this subject I am sorry to have to report, that I have been unable to make any arrangements with the Sunderbund Grantees, for the prevention or removal of obstructions from the Sunderbund Canals. The powers granted me by Section V. of Act XXII. of 1836, do not extend to the Sunderbund Canals: but supposing it was extended to the Navigable Channels as far Eastward as to meet Mr. May's jurisdiction, I do not think any Magistrate can require the services of the Ryots of the Sunderbund Grantees, as of those of a Zemindar under the permanent settlement.

4th. The numerous obstructions by roots of trees and Boats in the Bhowanypore and Bailey Gunge Canals, particularly the former, can only be removed by a Wreck Boat constructed for that purpose, if labourers are to be sent from Calcutta; and the accumulation of them can, in my opinion, be prevented only by damming up the Gobra Khal.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 523 to No. 546 inclusive, omitted.)

No. 547.

No 1911.

FROM CAPTAIN J. A. CROMMELIN,

Officiating Superintending Engineer, South-Western Provinces,

TO THE OFFICIATING SECRETARY MILITARY BOARD.

Barrackpore: 5th December, 1838.

SIR,

Copy of Superintending Engineer, 1507, 22nd October, 1838, to Captain J. Thomson.

No. 120, of 3rd November, 1838, Captain Thomson to Superintending Engineer, South-Western Provinces.

Copy of No. 1751, of 20th November, 1838, Superintending Engineer to Captain Thomson.

No. 131, of 1st December, 1838, Captain Thomson to Superintending Engineer, South-Western Provinces.

I do myself the honor of submitting herewith correspondence noted in the margin, relative to the project of increasing the width of the Road on the South side of the Ballea-ghatta Canal, 20 feet, and of restoring the slope of the bank on the same side.

2nd. It would ill become me in my present situation to take up the time of the Board on such a subject as the above. I shall therefore merely observe, that of the two propositions adverted to by Captain Thomson, that of raising the road and sloping the bank by taking earth from the mound at hand (Vide paragraph 4 of his letter, No. 120, of the 3rd), appearing liable to many objections, and involving the necessity of ultimate resort to the 2nd proposition,

viz. that of purchasing land parallel to the bank, and making a raised Road from the excavated Canal earth, at a distance of from 150 to 200 feet. This last can be the only measure for consideration.

3rd. With reference to the impracticability of making in the estimate of probable expence of such measure any approximation to the value of the land adjacent to the Canal, I should imagine that Captain Thomson, with his experience in such matters, aided by documents probably in his office, showing the cost of the ground on which the Canal was originally excavated, might exhibit in his estimate a medium value of the ground now, upon which to form a judgment; this appears called for as the necessity for the measure must involve also a consideration of the outlay.

I have the honor to be,

Sir,

Your obedient Servant,

J. A. CROMMELIN, *Captain,*

Officiating Superintending Engineer, South-Western Provinces.

No. 547. a.

No. 1507.

FROM CAPTAIN H. DEBUDE,

Superintending Engineer, South-Western Provinces,

TO CAPTAIN J. THOMSON,

Superintendent of Canals, &c.

Calcutta : 22nd October, 1838.

SIR,

I do myself the honor to annex a Copy of my letter No. 1504, of this date, to the address of the Secretary Military Board, and to request, that you will act upon the 5th and 10th paragraphs in the same manner as if you had received separate letters on the subject.

I have the honor to be,

Sir,

Your obedient Servant,

(Signed) H. DEBUDE,

Superintending Engineer, South-Western Provinces.

(True Copy.)

J. A. CROMMELIN, *Captain,*

Superintending Engineer, South-Western Provinces.

Sir

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Superintendent of Canals.

No. 547. c.

No. 1751.

FROM CAPTAIN H. DEBUDE,

Superintending Engineer, South-Western Provinces,

TO CAPTAIN J. THOMSON,

Superintendent of Canals, &c.

SIR,

Calcutta : 20th November, 1838.

With reference to my letter No. 1507, of the 22nd ultimo, and its enclosure, I do myself the honor to annex Copy of the Assistant Secretary to the Military Board's letter, No. 3789, of the 16th instant, and to request that you will act as pointed out by the Military Board.

2. As it appears by your letter No. 120, of the 3rd instant, that the course pointed out by me is liable to objections on account of the purchase of ground being a necessary preliminary, even to the framing of an Estimate, I beg that you will yourself suggest such a remedy for the evil complained of as may, on a full consideration of all the circumstances of the case, be in your opinion the best.

3. I should hope, that you might be able to recommend some mode of proceeding, the operations of which may be confined within the limits of the ground now available.

4. It occurs to me that as the price demanded for ground is likely to be very high, it might be better to give the bank a steep slope of perhaps 3 of base to 2 of height, strengthening it below high-water by rows of rough piling, and if necessary, sacrificing the Road on the south side altogether, but this is a point on which no one can possibly be so competent to judge as yourself, and I accordingly hope, that you will be able to send to me for submission to the Board, a scheme calculated to secure the permanence of the Canal bank at as moderate an expence as the general utility of the work will allow.

I have, &c.,

(Signed) H. DEBUDE,

Superintending Engineer, South-Western Provinces.

(True Copy.)

J. A. CROMMELIN, Captain,

Superintending Engineer, South-Western Provinces.

No. 547. d.

No. 134.

FROM CAPTAIN JOHN THOMSON.

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

South-Western Provinces.

SIR,

Calcutta : 1st December, 1838.

Previous to replying in detail to the several subjects brought forward in your Letter No. 1751, of the 20th November, I will state the circumstances connected with these which occurred some years ago.

2nd. In October 1836, the Canal Committee, of which I was a member, took into consideration the state of the Balleeghatta Canal, and with reference to the Docks proposed to be excavated in the Salt Water Lake came to the conclusion, that the work holding out the greatest probability of permanent improvement to the Balleeghatta Canal would be making

a (cutcha) Road parallel to the Canal at about 200 feet distant from it, taking earth from the Canal bank for this purpose.

3rd. In my Report No. 7, of the 16th May 1837, I enumerated the various works which I considered urgently necessary for the preservation of the Navigation of Tolly's Nullah and the Sunderbund Canals, and that to execute these works would occupy the whole of the time and attention of the Superintendent of Canals for three or four years.

4th. As I still continue to hold the same opinion on these subjects, which I did two years ago, I have the honor to reply [to] the 3rd and 4th paragraphs of your Letter, No. 1751, that I cannot suggest any work for the improvement of the Balceaghatta Canal that would not interfere with the execution of the far more important works required in the Sunderbund Canals and Tolly's Nullah, or which would not risk the interruption of the traffic through the Calcutta Canals, as observed by the 3rd paragraph of the Military Board's Letter, No. 3789, of the 16th November 1838. As it appears to me that for these reasons any work for the improvement of the Balceaghatta Canal must be deferred for several years, and as changes are always in progress, no estimate nor proposition made now would be of any use when the time arrived for executing the work.

5th. By the 2nd paragraph of letter No. 1751, before quoted, I understand the work proposed, namely, to slope the banks and procure ground to make the Road of sufficient width has been rejected, because the cost of the land to be purchased cannot be estimated, and not from the probable expence of the work, nor from any difficulties in executing it. In England the execution of the laws respecting the purchase of ground for public works is so far uniform in its effect, that an estimate of the cost of land and houses may be made within 10 per cent. of the expenditure; in this part of India the price of land purchased for public works under Regulation I. of 1824, varies from 5 to 10 and even 20 times the market price. This is a great evil and drawback to all public works, and with reference to its effect on the works for the improvement of the Canals, I am requested to suggest some remedy, this is not in my power to do, but while the evil exists, the consequences may be partly avoided by not requiring the cost of land to be estimated for before the merits or necessity for a work is considered.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 548.

No. 5681.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO THE OFFICIATING SUPERINTENDING ENGINEER,

South-Western Provinces.

SIR,

19th February, 1839.

I am desired by the Military Board to acknowledge the receipt of your letter No. 1911, of the 5th December last, and to request, that you will desire Lieut. Boileau to examine and report upon the subject therein mooted.

The papers received with your letter are herewith returned, which please send back with Lieut. B's. report.

(Signed) H. DEBUDE.

No. 549.

No. 442.

FROM CAPTAIN J. A. CROMMELIN,

Officiating Superintending Engineer, South-Western Provinces.

TO THE OFFICIATING SECRETARY MILITARY BOARD.

SIR,

Barrackpore : 27th June, 1839.

Referring you to my letter No. 91, of the 15th ultimo, I have now the honor to submit to the consideration of the Military Board, Captain Boileau's Report No. 2, of the 2nd ultimo, respecting the suggestions of Captain Thomson for the improvement of the Road and Bank on the south side of the Balliaghatta Canal, accompanied by such Remarks of my own as a careful examination of the locality, in company with the Superintendent, enable me to offer.

2nd. In the first place it is very true, as stated in the 2nd paragraph of the Report, that the traffic on the Road in question is at present small, for not a vehicle nor a beast of burden did we meet in the half hour we were there; whilst cows and goats were observed tethered along the side, and lying quietly in the middle of the Road. This however may be attributable to the condition of the Road itself, which is very bad, and I have therefore no doubt that its improvement would lead to increased traffic; but still I am not inclined at present to recommend any very large expenditure on this account.

3rd. I cannot say that I clearly comprehend in their several bearings the whole of the measures proposed; it appears to me however, that they may be divided into measures of improvement combined with utility; and measures of absolute necessity. Of the former the first is to purchase a strip of ground 30 feet wide along the whole length, 9,000 feet of the south bank of the Balliaghatta Canal, slope down, as well as practicable, the Bank, and raising with the earth thus procured and the superfluous earth already excavated at hand, the purchased land, to construct thereupon either a cutcha or pukka Road, as may be deemed expedient. Taking three-quarters of the maximum value of such a strip of land as estimated by Captain Boileau, the cost of this measure would be about 20,000 Rupees if a pukka Road, and about 17,000 Rupees if a cutcha Road only were made. The objections to this are, that it would be a half measure, it would neither permit of sufficient width to the Road nor of a fair proportioned slope to the Bank, nor yet leave room for contingent destructions of the Bank. I cannot therefore recommend its adoption.

4th. The next proposition is to purchase a strip of land 150 feet wide, parallel to the Canal south bank to the entire length of 9,000 feet, slope off the Bank to a proportion of $2\frac{1}{2}$ or 3 to 1, raising, as in the first case, the purchased land with the earth thus obtained, and to construct thereon a pukka Road 30 feet wide. Now, taking for calculation three-quarters of 18,400 or 13,800 Rupees as the probable cost of a strip 30 feet, and multiplying it by 5, we shall obtain 69,000 Rupees as the value of the strip 150 feet wide. Add to this, 6,000 Rupees for the pukka Road and sloping of the Bank, we have 75,000 Rupees as the total approximate cost. This measure has the advantage of being complete and final, and under the knowledge that the Canal is becoming wider (as I believe to be the case) every day, its execution may ultimately be rendered necessary, but at present I am of opinion, that good cause for incurring such a heavy expenditure cannot be shown.

5th. A mean between the above measures might probably be ultimately adopted with advantage, namely, to purchase land of about 60 feet wide, rectifying the slopes and forming the Road as above, which might be compassed at a cost of about 32,000 Rupees.

6th. The above proposition relate to experimental improvements to the Canal, and may be left for future consideration, in the meantime however, some measure must be speedily carried into effect to obviate the danger arising from the present state of a portion of the south Bank in question, extending easterly about 600 or 700 feet from the junction of the Circular with the Entally Canal. This Bank is retained from falling, merely by its own adhesive power being formed of tenacious stiff clay, and in some places it stands quite perpendicular, 12 or 15 feet high. Its fall would possibly carry with it a portion of the superincumbent Road, and thus cut off the communication: the inner side of the Road being in general bounded by fences or walls on ground not the property of Government. It is therefore absolutely requisite immediately to have recourse either to the purchase of a strip of ground 30 feet, running parallel to the length of the Bank endangered, viz. 600 or 700 feet, for the purpose of duly sloping the Bank and retiring the Road in proportion, or to the expedient of rough piling the Bank below high-water mark, as suggested by my predecessor, and referred to by Captain Boileau in the 6th paragraph of his Report under view.

7th. On the first point I have directed this officer to make enquiries relative to the price of the ground that will be required, and in the meantime would respectfully suggest, that he be called upon to prepare two separate Estimates, exhibiting the expence likely to be incurred in carrying each of these measures into effect.

8th. The Original Papers received with your letter No. 5681, of the 19th February last, are herewith returned agreeably to your request.

I have the honor to be,

Sir,

Your most obedient Servant,

J. A. CROMMELIN, *Captain,*

Offg. Suptdg. Engineer, South-Western Provinces.

No. 549. a.

No. 2.

FROM LIEUTENANT A. H. E. BOILEAU,

Superintendent of Canals,

TO THE OFFICIATING SUPERINTENDING ENGINEER,

South-Western Provinces.

SIR,

Calcutta: 2nd May, 1839.

I have the honor of acknowledging the receipt of your Letter No. 2983, dated 26th ultimo, and of your Letter No. 2538, of the 26th February last, therein alluded to, together with its enclosures, and beg to state, that the report now called for might have been prepared earlier, but that I was waiting to have the advantage of personally visiting the Balliaghatta Canal in your company, so as to have the benefit of your advice as to the best method of improving this Canal, but as it has unfortunately occurred that my own illness in the first instance, and your subsequent visit to the Midnapore division, have prevented me from acting in the manner proposed, I have now the honor of forwarding such a Report as I have been able to draw up on the subject, and have also the honor of returning the correspondence noted in the margin of your letter, No. 1911, dated 5th December, 1838.

2. With respect to the Road on the south side of the Balliaghatta Canal, it does not seem to me that there is at present sufficient traffic on it to justify the expenditure of any very large sum of money in making a Road parallel to the present edge of the Canal at a considerable distance from it. It would, I think, be better merely to give the existing Bank a proper slope, as sketched in Captain Thomson's letter No. 120, dated 3rd November, 1838, and to extend the south edge of the Road to about 30 feet beyond its present limits,

purchasing the ground for that purpose, which might perhaps be done in the following manner.

3. Good ground without buildings or trees is said to be selling in the neighbourhood of Entallee for 80 Rupees per Beegah, sometimes as low as 40, and occasionally at 100 Rupees, but I have heard that in the immediate neighbourhood of the Canal as much as 40 Rupees per *Cottah* or 800 Rupees per *Beegah* would be demanded. Taking the distance from the Kooleea Bridge to the Balliaghatta Docks at 11,000 running feet, and supposing that it would be necessary to purchase ground along the whole of this line to a width of 30 feet, the total area would amount to 330,000 feet, or nearly 23 Beegahs of ground. If the value of this land be estimated at the maximum price of 40 Rupees per Cottah, the amount of purchase money would be 18,400 Rupees, but it is possible that the purchase might be effected at about half of this price, or for little more than nine thousand Rupees, as there do not seem to be many houses in the way.

4. As the Banks of the Balliaghatta Canal are very low at their eastern extremity, and as the late Superintendent of Canals states that the present Road is 3 feet below its proper level, there does not seem to be any difficulty in disposing of the surplus earth that may be dug from the present Bank. Moreover, if it should be deemed advisable to build a Bridge over the Balliaghatta Canal, immediately to eastward of the junction of the Circular and Entallee Canals, a great deal of additional traffic might be thrown on to the proposed Road, which might, under these circumstances, be metalled or made *pucka* from the conflux of the Canals to the Balliaghatta Dock, a distance of about 9,000 feet, and it would be advisable that this Road should be sufficiently raised to prevent it from being inundated at any time of the year.

5. I am informed that the *pucka* Road on the west Bank of the Circular Canal cost 12,000 Rupees, the length being about 19,000 feet, and as the length of the Balliaghatta Canals is only half this quantity, the new Road might be made for 6,000 Rupees, with 9,000 for the purchase of ground, besides the expence of sloping the Bank and of building the Bridge above-mentioned. I have not however found time for making any estimate in detail, and would not recommend any such expensive improvements to be undertaken at present; but should it be deemed expedient, at any rate, to improve the Balliaghatta Canal, perhaps the cost of sloping of the Banks and making an earthen or *cutcha* Road, 11,000 feet long, from Kooleea Bridge to the Balliaghatta Dock, as mentioned in the 3rd paragraph, would not exceed 8 annas per running foot, or 5,500 Rupees, exclusive of the price of the ground: much of the Bank being in a pretty good state already.

6. Should it appear that this kind of improvement would be too costly, a still less expensive and tolerably efficient method might be followed, as suggested in the 4th paragraph of letter No. 1751, from the Superintending Engineer, South-Western Provinces, dated 20th November 1838, namely, to give the Bank a steep slope, supporting it below high-water mark by rows of rough piling. This would only be required for a short distance where the Bank is very precipitous, and where it appears to be prevented from slipping into the water solely by the tenacity of the earth of which it is composed.

7. In conclusion I beg to state, that if estimates are required for any of these various kinds of improvement, I will endeavour to frame them as accurately as my short experience in this department will enable me to do.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Lieut. Engineers, Superintendent of Canals.

No. 550.

No. 1826.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO THE OFFICIATING SUPERINTENDING ENGINEER,

South-Western Provinces.

2nd August, 1839.

SIR,

I have the honor, by desire of the Military Board, to acknowledge the receipt of your letter No. 442, of the 27th June last, submitting one from Captain Boileau, on the subject of the several schemes for securing the permanence of the southern Banks of the Balliaghatta Canals.

2. In reply I am instructed to say, that as the maintenance of the Canal Bank is the most essential point, the Board desire that Captain Boileau will estimate for strengthening it where necessary by roughing, and for constructing as good a pukka Road as the land available for it will admit.

3. If it is found necessary, on account of want of space on the south side, to adopt such a measure, the piles might perhaps be driven along a line corresponding nearly with the original assignment of the south Bank, leaving the silt which is supposed to have been deposited on the north Bank to be excavated by dredging or hand-labor, whichever Captain Boileau may consider more advisable.

I am, &c.,

(Signed) H. DEBUDE.

(No. 551 to No. 561 inclusive, omitted.)

No. 562.

No. 815.

FROM CAPTAIN J. A. CROMMELIN,

Officiating Superintending Engineer, South-Western Provinces,

TO THE OFFICIATING SECRETARY MILITARY BOARD.

Barrackpore: 21st August, 1839.

SIR,

With reference to your letter No. 5710, of the 22nd February last, desiring me, in communication with Captain Boileau, to furnish further information regarding the disposable ground at the Balliaghatta Docks, I have now the honor to lay before the Board two letters on this subject, Nos. 195 and 197, of the 2nd March and 16th ultimo respectively, from Captain Boileau, together with the returns and statements alluded to in the latter communication.

2nd. The delay in replying to your letter has been caused, as you will observe, by the time necessarily employed in obtaining the detailed information supplied in these documents.

3rd. It would appear, that the whole of the 36 Lots within the Dock premises are now let, and that the average monthly number of Boats entering the Docks is 232. Captain Boileau

however has not been able to ascertain the amount of goods that may have been warehoused, and is of opinion, that ground rent ought not as yet to be demanded from the lease-holders.

4th. If it were intended that the ground should remain in its present unfinished state, and that no improvement of the Road to Calcutta should be effected, I should concur in the above opinion, but considering that the Board have lately (in their letter No. 1826, of the 2nd instant) directed that this medium of communication on the south bank of the Canal should be made pukka, I would suggest, that the improvement be extended to the whole of the Dock Roads, 6,983 feet in length to a breadth of 20 feet, and the surfaces be properly levelled and rammed.

5th. If this be done, I feel assured that good warehouses will speedily rise, and that rent will be cheerfully paid. The Boat owners, sellers of wood, &c. will find it to their advantage either to store or to dispose of their Cargoes at the Docks, in preference to undergoing the delays experienced in the Canal transit. I am far however from recommending that the whole of the ground should be leased out; the three north Docks nearest the entrance might be retained free for the public; and if it should hereafter be ascertained that these are more than enough for the accommodation of the Bonts seeking shelter, and that the leasing-on-rent scheme answer (of which I have little doubt), another Dock might be given up for the erection of store-houses. Fewer however than two Docks should not, in my opinion, be reserved for public accommodations.

6th. All regulations respecting the construction, nature, and dimensions of these structures; the collection of rents, charges for storing goods, &c. might, I imagine, safely be left with Captain Boileau.

I have the honor to be,

Sir,

Your most obedient Servant,

J. A. CROMMELIN, *Captain,*

Offg. Suptdg. Engineer, South-Western Provinces

No. 563.

No. 820.

FROM CAPTAIN J. A. CROMMELIN,

Officiating Superintending Engineer, South-Western Provinces.

TO THE OFFICIATING SECRETARY MILITARY BOARD.

Barrackpore: 21st August, 1839.

SIR,

Referring you to my letter No. 605, of the 22nd ultimo, I now do myself the honor of submitting for the consideration of the Military Board, the result of my observations on certain works at the Balliaghatta Docks, proposed in Captain Thomson's Estimate No. 3, dated 17th December 1838, returned to me with your office letter No. 5682, of the 19th February last.

2nd. On the 26th ultimo, accompanied by Captain Boileau, I examined the Balliaghatta Docks.

3rd. Captain Thomson proposes to level the Roads or portions of raised ground 80 feet wide, between the Docks, having an aggregate length of 6,983 feet to a breadth of 20 feet; to cut drains on each side of these Roads longitudinally, for the reception of the water; and at

their angles of junction with the main Road, common to all the Docks, to form Brick on edge Drains, to receive and conduct into the Docks, the whole of the water poured into them from the cutcha side Drains.

4th. The whole place is at present in an unfinished state, and it is somewhat difficult, considering the unfavourable nature of the soil, to say what steps ought to be taken for its improvement. The excavated earth has been somewhat hastily thrown up, and the surface left concave, unlevelled, and untrimmed, having in many places hollows, now forming little pools of water. The soil is black, of a crumbling nature, impregnated with salt; and I have doubts as to the practicability of giving sufficient stability to the foundations of the corner pukka Drains. I fear also, that there would be a difficulty in so managing the falls of the Roadside cutcha Drains as to prevent rushes of water which would wash away much soil. Captain Thomson does not specify the exact position of these longitudinal Drains. If made close to the sides of the 20 feet Road, there would still be about 30 feet on each side undrained, of which the water would run down the side Banks, or if cut on the very edge of the Banks the water might lodge, percolate and cause slides. The above measures therefore, I cannot, for the present, recommend.

5th. The Funnel Drain proposed by Captain Thomson is, I think, necessary; it will serve to keep down the level of the water standing to the west of the Dock Premises, and to restore through the Docks the communication between Mr. Prinsep's salt works and the Canal water, a communication which formerly, as I understand, existed direct with the Canal, and was cut off by Captain Thomson.

6th. The propositions brought forward in Captain Thomson's Estimate having in view the improvement of the Docks, with the ultimate object of leasing out the disposable ground, I take the liberty of referring the Board to my letter No. 815, of this date, for some observations on this subject.

7th. The estimate received with your letter No. 5682, of the 19th February last, is herewith returned.

I have the honor to be,

Sir,

Your obedient Servant,

J. A. CROMMELIN, *Captain,*

Officiating Superintending Engineer, South-Western Provinces.

No. 563. a.

CANAL DEPARTMENT.

ESTIMATE No. 3.

Estimate of the probable Expence of levelling the Roads and constructing Brick on edge Drains at the Balleaghatta Docks, called for by Officiating Superintending Engineer, South-Western Provinces, Letter No. 1942, 8th December 1838.

Calcutta : 17th December 1838.

Description.—The Roads at the Docks are 6983 feet in length, they will be levelled to a breadth of 20 feet, and Drains made at each side into which the water from the Roads and the Banks will fall; these Drains will terminate at the angles where the Roads meet, and the water conducted from thence into the Docks by 15 Brick on edge Drains down the

slopes, each Drain will be 20 feet long, 5 feet wide, and 9 inches thick, and 13 of them will be protected from being damaged by hackeries, by a saul-wood post, 7 feet long and 9 inches square—at the junction of the Canal Road with the Docks, a Tunnel Drain, $1\frac{1}{2}$ feet in diameter and 40 feet long, will be made.

EARTH WORK.

	Length.		Breadth.				Square feet.
Levelling Roads, ..	6983	×	20	..	..	..	=139,660

BRICK WORK.

	No.	Length.		Breadth.	Thick.	C. Ft.	
Brick on edge Drain, 15	×	20	×	5	×	75	=125
Tunnel Drain, ..	1	×	40	×	$40\frac{909}{2}$	— 1.767	=125.68 =1,250.68

WOOD WORK.

	No.	Length.		Scantling.		Rg. Ft.
Posts,	13	.. .. .	7	.. .. .	(9 × 9)	.. .. . =91

ABSTRACT.

139,660 Square Feet of Levelling Road, at 5 As. per 100 square feet, ..	=	436	7	0
125,068 C. Ft. of Brick on edge Drains, at 16 Rs. per 100 C. Ft., ..	=	200	1	9
91 Running Ft. Saul Post (9 × 9), at 12 As. per Foot, ..	=	68	4	0

Total Company's Rupees, Seven Hundred and Four, Twelve Annas and Nine Pie, 704 12 9

J THOMSON, *Captain,*
Superintendent of Canals.

No. 563 $\frac{1}{2}$.

Extract of a Letter dated 9th September 1839, from Captain A. H. E. BOILEAU to Captain H. DEBUDE.

“ After again looking over all the papers connected with the Balliaghatta Docks, I am of opinion—

1. That they will not bear to be taxed with any Ground Rent until about the 1st January next.

2. That if pukka surface Drains were built now, they would most likely have to be rebuilt soon, but the pukka Tunnel might be constructed at once.

3. The entire spurs of ground between each Dock ought to be carefully levelled immediately after the rains, including the sites of the Godowns (merc mat sheds) said to have been erected, but which have nearly all been destroyed by the rains.

4. That the making a pukka Road from the Koolia Bridge to the Docks, along the south side of the Balliaghatta Canal, would be a great convenience to the public ; and if the

ground inside the Docks is found to be sufficiently settled, it would be proper to adopt Crommclin's suggestion of metalling the branch Roads between each Dock.

5. That Boats coming from the Eastward should be made to pay Toll on entering the Dock, and that *all* Boats lying there should be made to pay water rent if no ground rent is taken from the lease-holders; but I think that a ground rent of 3 Rupees per cottah, may fairly be demanded, should the above pukka Roads be made.

6. If the Dhapa Toll Station is removed farther to the Eastward, as already ordered by the Military Board, no Boats from that quarter can get into the Dock without paying Toll: but so many of the Toll people have already died, and so many more have fallen sick, that I am afraid to move the Toll-house yet, as the new Station would be more unhealthy than the old one.

7. Frequent representations have been made to me that Boats are unable to get into the Docks more than once a day, as the gates are kept shut except at high-water, and that the traffic would be greatly increased if they were opened whenever Boats arrived, (which is impossible;) or if the gates were allowed to remain open at all times. This would lead to a deposit of silt which would be injurious after October, but I purpose throwing the gates open for a month on trial, (when no harm would be done) to see if the traffic would really increase.

8. One of the lease-holders, Rustomjee Cowasjee, states, that if pukka Roads were made, he would expend three or four thousand Rupees in building pukka Godowns on his allotment."

No. 564.

No. 2580.

FROM THE SECRETARY MILITARY BOARD,

TO THE OFFICIATING SUPERINTENDING ENGINEER,

South-Western Provinces.

13th September, 1839.

SIR,

In reply to your letter No. 820, dated the 21st ultimo, returning Captain Thomson's estimate for certain works proposed to be constructed at the Balliaghatta Docks, with your opinion on the same, I am instructed by the Military Board to request, you will call on Captain Boileau to submit Plans and Estimate of the Tunnel Drain recommended in the 5th para. of your Letter under reply.

2. With reference to the subject of your communication No. 815, dated the 21st ultimo, I am desired to say, the question will be held over for the present.

I am, &c.,

H. DEBUDE.

(No. 565 and No. 566 omitted.)

No. 567.

No. 2726

Extract of a Letter from the Military Board to the Deputy Governor of Bengal, dated 20th September, 1839.

“ With reference to the 3rd and 4th paragraphs of our Report No. 3788, dated the 16th November, and to the 2nd paragraph of Mr. Secretary Halliday's letter No. 2223, bearing date the 26th December last, on the subject of repairing the damaged state of the south Bank of the Balliaghatta Canal and of restoring the Road on the same side, we now do ourselves the honor to submit the undermentioned estimates, and to recommend them for sanction.

(Enter Estimates Nos. 95 and 98, Book B. of 1839-40.)

2. The former provides for strengthening the Bank by having a row of rough piling driven along a line corresponding nearly with the original assignment of the south Bank.

3. The other provides for a pukka Road on the same side of the Balliaghatta Canal, extending from the Koolia Bridge to the Docks.

4. We consider both these works likely to be highly useful, and the former absolutely indispensable ; for, if the Bank is not well protected, there is no security against the whole of the ground, now the property of Government, being cut away.

5. The Road is reported by Captain Boileau to be much required, and we do not doubt, that as the Docks come more fully into use, the Road also will be much frequented. It is not now passable in the rainy season.

6. In the execution of this work we shall direct a modification of the proposed mode of metalling, by increasing the depth of the kloa to nine inches, and dispensing with the two layers of flat bricks. We believe that this change will considerably diminish the expence of work.”

No. 568.

No. 171.

FROM CAPTAIN A. H. E. BOILEAU,

Collector of Tolls,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 18th September, 1839.

SIR,

Having been recently called upon by the Accountant Revenue Department, to account for the great deficiency in the collection of Tolls during the past year, the amount therein realized having decreased from Rs. 1,71,000 to Rs. 71,000. I have the honor of soliciting the attention of the Military Board to that part of my predecessor's Report No. 127, dated 19th November 1838, which relates to the amount of traffic carried on in Canoes or Boats of less than 25 maunds of burden.

2. It is not proposed that any alteration should be made in the existing Regulations, but a verbal order is said to have been issued by the late Collector of Tolls, that all Canoes cut out of a single timber, called by the Native *Saltee* or *Donga*, should be allowed to pass free ; and I am informed that this class of Boats is now plying in such numbers, not by twos or by

threes, but by hundreds, in Tolly's Nullah, that the revenue is seriously affected, as very many of them are between 25 and 50 maunds burden.

3. There is now in the Iron Yard a Canoe of this description, the dimensions of which are $29.7 \times 3.1 \times 1.2 = 108$ cubic feet, its real tonnage is therefore about 54 maunds, or by rejecting fractions of a foot, $43\frac{1}{2}$ maunds, liable to an amount of Toll equal to 2 annas; and to prevent any farther loss to Government by the free use of Boats of this description, I yesterday issued a written order that all Boats of whatever description, including Canoes, &c. which are in excess of 25 maunds burden, should pay the amount of Toll prescribed in the Regulations, which will, I hope, add considerably to the amount of future collections.

4. It has also been reported to me, that great numbers of these Canoes, and occasionally other Boats of a different kind, ply between the Soonderbund Creeks and Tolly's Nullah by the two Khals, falling into the latter between Gurriahath and Tolly Gunge, paying no Toll, as they never go near either the Panspota or Kyderpoor stations, which are 11 miles asunder; and I have myself seen the mouth of the Kamapokurcea Khal crowded with Canoes conveying grain into Tolly's Nullah: I have therefore stationed at that point a Mohurir with one Koyal and one Piada from the Panspota station, for the purpose of collecting Toll upon all dutiable Boats entering Tolly's Nullah in this surreptitious manner, which arrangement will, I hope, be approved by the Military Board.

5. It would also be expedient to have a separate set of Tickets, headed "Russa station," printed immediately for this particular purpose: that the Bengallee or English numbers on the Panspota Tickets may not be confused by being issued in two places, and the trifling expence likely to be incurred by this measure, will be amply repaid by the very large increase which I confidently expect to exhibit in all future returns.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Collector of Tolls.

No. 569.

No. 2757.

FROM THE SECRETARY TO THE MILITARY BOARD.

TO CAPTAIN A. H. E. BOILEAU,

Superintendent of Canals.

SIR,

20th September, 1839.

I have the honor, by desire of the Military Board, to acknowledge the receipt of your Letter No. 171, dated the 18th instant, submitting certain propositions for exacting Toll from Canoes or small Boats to the full extent allowed by the Regulations, as also for collecting Toll from all Boats entering Tolly's Nullah at the mouth of the Kamapokureea Khal, and for printing separate Tickets on this account.

2. In reply I am instructed by the Military Board to intimate their approval of all your suggestions.

I am, &c.,

(Signed) H. DEBUDE.

(No. 570 omitted.)

No. 571.

No. 181.

FROM CAPTAIN A. H. E. BOILEAU,
Collector of Tolls,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 23rd September, 1839.

SIR,

I have the honor of forwarding for submission to the Military Board, copies of a Circular Letter No. 86, from the Secretary to the Sudder Board of Revenue, Fort William, and of my answer No. 180, dated 21st instant.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Collector of Tolls.

No. 571. a.

CIRCULAR.

No. 86.

FROM E. CURRIE, ESQUIRE,
Secretary to the Sudder Board of Revenue,

TO CAPTAIN A. H. E. BOILEAU,

Miscellaneous Department.

In charge of Tolly's Nullah, &c.

SIR,

I am directed by the Sudder Board of Revenue to request, that you will report direct to this office, the system of management and check, which prevails in the collection of Tolls under your superintendence, and at the same time submit a statement of collections for the years 1838-39.

*Present,
J. Pattle, C. W.
Smith, and J.
Lowis.*

*

I have the honor to be,

Sir,

SUDDER BOARD OF REVENUE,

FORT WILLIAM :

The 11th September, 1839.

Your most obedient Servant,

(Signed) E. CURRIE,

Secretary.

No. 571. b.

No. 180.

FROM CAPTAIN A. H. E. BOILEAU,
Engineers, Collector of Tolls,

TO E. CURRIE, ESQUIRE,

Secretary to the Sudder Board of Revenue, Fort William.

Canal Office, Calcutta : 21st September, 1839.

SIR,

In obedience to your Circular letter No. 86, without date, I have the honor of forwarding for submission to the Sudder Board of Revenue, a statement of the amount of Toll collected during the years 1838-39.

2. I have also the honor of detailing the system of management and check prevailing in the collection of Tolls under my superintendence.

3. The Tolls are collected on two separate lines of navigation, the one comprising the Circular Canal from whence it leaves the river Hooghly at Cheetpore, skirting the northern and eastern environs of the City of Calcutta, by Ooltadunga, Narculdunga, Sealda, &c. for a course of $3\frac{1}{2}$ miles, when it meets the Entalee Canal an aqueous *cul de sac*, so to speak, which runs eastward from near the end of Dhurmtolla street for one mile, until it joins the Circular Canal as above-mentioned; the united waters of these two Canals then run eastward for $1\frac{1}{2}$ miles under the name of the Balliaghatta Canal, entering the Salt Water Lake at Dhapa Manpoor, where a Toll Station is established, as well as at the opposite extremity of this line of navigation at Cheetpore, distant $5\frac{1}{2}$ miles by water from Dhapa.

4. The second line of navigation lies entirely to the southward of Calcutta, following the course of Tolly's Nullah south-eastward from its mouth at Hasting's Bridge, where there is a Toll-house called the Kyderpoor Station, past Alipoor, Bhowancepoor, Tolly Gunge Russa Pugla, Guria Hath, &c. to Panspota, where another Toll Station is established about 11 miles from the first mentioned one at Kyderpoor.

5. The amount of traffic on the northern line of navigation above described during the years 1837-38, was 52,549 Boats, paying 90,733-5-0 Toll, and in the years 1838-39, there passed 41,349 Boats, paying 37,446-3-4, the rate of Toll having been reduced from one Rupee to eight Annas per hundred maunds of tonnage from the commencement of this year. On the southern line, or Tolly's Nullah, the amount of traffic in 1837-38 was 25,644 Boats, paying 69,935-8-0, and in 1838-39 it was 21,055 Boats, paying 28,472-14-5, the rate of Toll having also been reduced one-half on this line.

6. It appears from the above statement, that there has been a very large falling off in the revenue derived from these Tolls during the past year, much greater indeed than can be ascribed to the lowering the rate of Tollage; this deficiency is chiefly attributable to two causes, viz. the great increase in the number of Canoes and small Boats exempt from Toll, which ply by hundreds, carrying on a considerable traffic, especially within the southern line of navigation, and 2ndly, the dishonesty of the Native establishment employed in making the collections, which is by far the most serious evil of the two.

7. It was notorious when I took charge of the office of Toll Collector in the month of February last, that the Native Toll Establishment were dividing among themselves about 2,000 Rupees per month, which were of course fraudulently deducted from the Revenue that ought to have been credited to Government, and though the late Collector of Tolls took considerable pains to check this system of embezzlement, and removed some of the offenders, yet so cunningly were the frauds carried on, that their detection was exceedingly difficult, and the revenue continued to suffer a heavy loss.

8. In the first month of my taking charge of this office, i. e. in February 1839, the Collections were 2,820-1-0, in defect of what they were in the same month of the preceding year, in March they were 2,292-13-3 in defect; in April the deficiency was only 524-1-3, and from that time there has been a steady increase: the subsequent collections for May, June, July, and August, being respectively 1,194-4-10; 1,352-6-10; 2,229-12-10; and 2,270-7-8, in excess of the corresponding months in the preceding year, and I confidently anticipate that this increase will be permanent if I am permitted to continue the system which will be detailed below.

9. It is evident that this beneficial change could only have been brought about by severe measures, and after much trouble in detecting the abuses already mentioned, but having taken considerable pains in bringing forward and proving certain cases of embezzlement, extortion and neglect of duty, making seizures of Boats unprovided with Toll Tickets, &c. and by discharging nearly the whole of the Amla by whom these frauds were permitted, and

replacing them by more trust-worthy individuals, I have at length succeeded in putting the Toll Department upon a better footing, though it is to be feared, that even now some of the individuals employed in the Collections would imitate the bad example of their predecessors if they found any opportunity for doing so.

10. The establishment for collecting Toll at present consists of 4 Toll Darogahs stationed at Panspota, Kyderpoor, Dhapa and Cheetpore, who respectively receive 100, 75, 100, and 50 Rupees monthly, furnishing their own establishment of Mohurirs, Koyals or Measurers, Piadas, &c. which consumes a considerable part of their nominal salary. It has however been recommended to Government, that the establishment at each Koot Ghat or Toll Station should be paid by the State, and that the salaries of the Darogahs, after a small reduction in their amount, should be made personal and subject to no deduction.

11. To assist in checking attempts to evade or resist payment, and to prevent damage to the Canal Banks, a small Conservative Police is kept up, consisting of 1 Jamadar and 6 Burkundazes for Tolly's Nullah and 1 Jamadar and 5 Burkundazes for the Circular Canal, &c. their pay being at 11 and 5 Rupees each respectively, but this Police establishment is far too small, as the 11 Burkundazes have to look after about 18 miles of navigation. One Jamadar is stationed at Russa Pugla, about midway between Panspota and Kyderpoor, and the other one at the middle of the south Bank of the Balliaghatta Canal, within a mile of Dhapa, as this is by far the most important of the four stations.

12. Printed Toll Tickets are furnished to each Toll Darogah, headed with the name of his own Station, and bearing an English number before they are issued from the Collector's Office, so that they may not be changed for fraudulent purposes. The Tickets are printed in duplicate in two columns, separated by flourished penwork as in Banker's cheques, so that each Ticket when cut off and delivered to the Boatmen, after the Bengalee Number, Manjee's Name, Amount of Toll, and other particulars have been duly entered, can be at any time compared with its counterpart, and erasures or alterations be immediately detected.

13. A printed list of Tickets, abstract and envelope, with a particular seal are also furnished to each Darogah, who sends daily to the Toll Office a packet containing the counterpart of all Tickets issued by him during the preceding day, and a numerical List of the same for reference, together with two bundles of the Tickets formerly issued from his own Station, or from the Station at the other end of the Canal, and collected during the day from the Boats which have passed out: each Darogah, also sends daily to the Station at the other end of his own line of navigation a counterpart of the numerical List furnished to the Toll Office, so that the Darogah at the other end may be able to ascertain that none of the Tickets which he collects from Boats going out have been falsified for the avoidance of demurrage or any other kind of fraud.

14. The amount of Tolls collected at each Ghaut should properly be paid by the Darogah, either into the Toll Office, or direct into the nearest Government Treasury; but a very objectionable system has prevailed of employing an irresponsible person, who neither attends regularly at the Collector's nor receives any salary from Government, but is paid by a forced contribution of 75 Rupees monthly from the four Darogahs, and pays the amount of their Collections three times a month into the General Treasury under a Chulan or warrant from the Superintendent of Canals in his capacity of Collector of Tolls. A change in this system has already been recommended to Government, and in the meantime, instead of dealing with an irresponsible person, I have taken security to the amount of 5,000 Rupees from the individual thus employed.

15. It is evident from what has been stated above, that a Toll Darogah stationed four or five miles off the nearest Checking Jamadar's Station, which is the case with three out of four of those under my employ, could allow hundreds of Boats to pass in and out again without paying any Toll, if he pleased to do so for any gratuity or douceur that might be paid

to himself, and doubtless the Revenue has been deprived of many Thousands of Rupees in this manner. The best remedies appear to be honesty in the Darogah, activity and integrity in the Jamadar, and unceasing vigilance in the Collector of Tolls, who may effect much good by liberally rewarding the Conservative establishment for every seizure made, and by severely fining the Darogah, Boatmen, &c. for every case of negligence or fraud.

16. In addition to these means, it should be an invariable Rule to listen to and investigate every complaint or petition of whatever nature connected with this Department; and hundreds of notices in English, Persian, and Bengalee have been printed, inviting all parties who may either have been hindered in the free navigation of the Canals, or from whom money may have been extorted in excess of the due amount of Toll, to make their grievances known at the Canal Office, when due attention would be paid to their complaints.

17. It is understood that an idea has been entertained of farming out the Tolls, but though persons might be found who would promise to pay somewhat more than the sum at present collected, and to furnish good security for the fulfilment of their contract, yet this measure would, in my opinion, be attended with such grievous extortion, and so much irremediable distress to the thousands of Boat proprietors who navigate these Canals, that the trifling increase of Revenue derivable from such a source would be dearly purchased by ten times the sum being extorted from those who would fall under the unsparing hand of the farmer. The free navigation of the Canals would be impeded, the inland trade of Calcutta would probably be seriously injured, and after draining the unfortunate boatmen to the uttermost, when nothing more remained to be extorted, the farmer would perhaps request permission to throw up his contract, stating truly enough that he would be a great loser by continuing it: for he would by this time have completely killed the goose which laid his golden eggs, and the Canals thus deteriorated, would be again thrown upon the hands of Government.

18. Were it possible by any enactment to prevent more than the authorized sum being taken from Boats, or were heavy fines, with imprisonment where violence was added to extortion, to be inflicted upon the offending parties by the Canal Magistrate, a partial, though by no means an efficient check, might be kept upon the farmer; but probably the whole time of the Superintendent of Canals would be occupied in this business, as a hundred petitions and complaints against the native Toll Collectors might be brought to the office in place of each one that now finds its way there. The present establishment merely hold their situations "de bene placito," or as long as they behave well, not so the contractor or farmer; and when it is recollected that the Collector of Tolls receives no remuneration whatever for this duty, troublesome as it is even at present, it would be hard to expect him to perform gratuitously the still more irksome and vexatious duty of keeping the farmer in order; and as far as I am personally concerned, I would infinitely prefer retaining charge of the Tolls upon their present footing.

19. Should any thing be omitted in the above report, which ought to have been submitted for the consideration of the Sudder Board of Revenue, I beg that the omission may be excused in consideration of the very short time that I have had charge of this Office; and if farther information be required, as I am about to proceed immediately to sea for the benefit of my health, I beg to refer you to the undermentioned Correspondence.

The Superintendent of Canals to the Secretary Military Board, No. 127, dated 19th November 1838, and No. 29, dated 21st May 1839.

The Superintendent of Canals to the Accountant General, No. 204, dated 13th March 1839.

The Collector of Tolls to the Accountant Revenue Department, No. 156, dated 9th September 1839.

I have, &c.,
(Signed) A. H. E. BOILEAU.

No. 571. b.⁽¹⁾

*Statement of Toll Collections, and Ground Rents, &c., from
1st May 1838 to 30th April 1839.*

1838.	Toll Collections.	Ground Rents, Ferry and Fishery.	Total.
May,	6,439 8 0	64 8 10	6,504 0 10
June,	4,973 1 0	48 12 10	5,021 13 10
July,	4,976 4 9	676 4 10	5,652 9 7
August,	5,005 4 5	64 8 10	5,069 13 3
September,	4,469 6 6	31 11 6	4,501 2 0
October,	5,646 9 6	79 12 6	5,726 6 0
November,	5,638 3 0	104 8 10	5,742 11 10
December,	5,045 2 7	48 12 10	5,093 15 5
1839.			
January,	5,530 2 3	88 12 10	5,618 15 1
February,	6,126 13 9	64 14 5	6,191 12 2
March,	6,947 9 9	49 2 5	6,996 12 2
April,	5,121 0 3	89 2 5	5,210 2 8
	65,919 1 9	1,411 1 1	67,330 2 10

A. H. E. BOILEAU,
Capt. Engineers, Collector of Tolls.

No. 571. b.⁽²⁾

ABSTRACT.

- Para. 1. Forwarding Statement of Tolls collected during the years 1838-39.
- .. 2. Detailing system of management and check.
- .. 3. Describing the northern line of navigation on which Tolls are collected, including the Circular Canal, &c.
- .. 4. Describing the southern line of navigation by Tolley's Nullah.
- .. 5. Stating the number of Boats passing, and amount of Toll realized during the years 1838-39.
- .. 6. Explaining great decrease in the collections.

- Para. 7. Difficulty in preventing embezzlement by the Native Toll Establishment.
 „ 8. Efficacy of means adopted for increasing the revenue.
 „ 9. Reformation effected by discharging all the old Amla, seizing Boats without tickets, &c.
 „ 10. Detailing the present establishment for collecting Tolls.
 „ 11. Remarks on the Conservative or Police Establishment.
 „ 12. Explanation of the Toll Tickets issued to Boats.
 „ 13. Method of detecting attempts to falsify tickets.
 „ 14. System of making payments into the Treasury.
 „ 15. Requisites for the prevention of fraud.
 „ 16. Propriety of investigating all complaints.
 „ 17. Reasons against farming the Tolls.
 „ 18. Additional trouble it would give to the Superintendent of Canals.
 „ 19. References to other Report in case of any deficiency of information in this one.

(True copy.)

A. H. E. BOILEAU,

Capt. Engineers, Collector of Tolls.

(No. 572 to No. 610 inclusive, omitted.)

No. 611.

No. 82.

FROM CAPTAIN A. H. E. BOILEAU,

Collector of Tolls,

TO THE MAGISTRATE OF 24-PERGUNNAHS.

Calcutta : 4th July, 1839.

SIR,

I have the honor of reporting for your information, that two Boats yesterday passed the Dhaphah Toll Station by force, and were captured after considerable resistance. The principal offenders being lodged in the Manicktolla Police Station (Entallee), and the Boats were made over to six Chowkeedars, named Suleem, Mohigoodcen, Pittember, Sookur, Korces, and Koodrutoola. The two first were, I believe, principally in charge, but to my surprise, on visiting the Entallee Canal this morning, both Boats had disappeared, and the Chowkeedars reported that they had been taken away during the night.

2nd. As it is quite useless for me to make seizure of Boats liable to be confiscated under Article IX. of Act XXII. of 1836, if the Police authorities, to whom they are made over, are thus negligent of their charge, I should [be] greatly obliged by your taking such notice of this matter, &c. which may prevent Chowkeedars from again letting go any Boats committed to their care under these circumstances, and that they may have no plausible excuse for neglecting their duty. I beg to state, that I am always willing to remunerate any number of men that may be employed either in making the seizure or in retaining charge of the Boats when captured.

I have, &c.,

(Signed) A. H. E. BOILEAU,

Captain Engineers, Collector of Tolls.

No. 612.

No. 284.

To CAPTAIN A. H. E. BOILEAU,

Superintendent of Canals.

SIR,

You have, on two occasions, brought to my notice the circumstance of Police Chowkeedars allowing Boats captured by the people of your establishment, and committed to their custody, to be removed during the night, and you request me to take such measures as may prevent the recurrence of the evil.

2nd. With every desire to assist you in the discharge of your duties, by means of my Police, and ready to punish any instance of proven delinquency on their part, I cannot view their present conduct in the culpable light you appear to do, for the following reason : During the day time, I conceive that their services are available for all public exigencies within the range of their vocation, and can be fairly and legitimately devoted to them, but the moment night falls, their immediate and express sphere of duty, to the exclusion in my opinion of every other, must be considered to consist in patrolling and guarding the lives and properties of the residents within their circuit or beat, which are expressly consigned to their keeping.

3rd. Since then your calls on them have been manifestly unseasonable, and at moments when their services could not be legitimately claimed by you, and as by the concluding words of your letter to my address No. 82, of the 4th ultimo, you appear to have the command of other means for the accomplishment of the object in view, I would suggest the propriety in exercise of the above discretion, of your hiring men to assist your establishment in the seizure and protection of Boats hereafter liable to capture, instead of applying to the Police for aid on the occasion, or I would rather say, being dependent solely on them for the performance of the duty.

I am, &c.,

ZILLAH 24-PERGUNNAHS :

The 26th August, 1839.

(Signed)

J. H. PATTON,

(True Copies.)

Magistrate.

(Signed)

A. H. E. BOILEAU,

Captain Engineers, Superintendent of Canals.

No. 613.

No. 285.

FROM CAPTAIN A. H. E. BOILEAU,

Superintendent of Canals,

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 13th January, 1840.

In obedience to your letter No. 4553, dated 3rd instant, I have the honor of submitting for the consideration of the Military Board, a concise Statement of the Conservative duties of the Canals on account of the establishment required, and a comparative statement of income and expenditure since I took charge of the Calcutta Canals.

2. The duties of the Conservative Establishment are as follows :—

1st. To prevent obstruction to the navigation or injury to the Banks of the Canals.

2nd. To assist the Toll Darogahs when Boats may be taken forcibly past their Stations without paying Toll.

3rd. To take care that no Boats, &c., remain in the Canals with Tickets. In executing the above duties the Jemadar in charge of the Conservative Department on each line of Navigation ought to examine the Tickets of every Boat, and detain all such as appear to be suspicious, either from incongruous dates, names, or tonnage, he ought to take immediate notice of every sunken Boat and broken up raft of timbers or float of bamboos whose

Ticket he forwards to the Canal Office, and expedite the raising of such Boats as can be floated, or the breaking up of such as cannot be removed, and the sales of such as are forfeited by law; he ought also to prevent Boats from being made fast to the Bank in any manner contrary to the Regulations, and to apprehend any persons digging into or any way injuring or defiling the Banks, trees, fences, mooring, posts, &c. Written report on these subjects are constantly furnished to the Canal Office.

3. The total extent of Navigation now considered within the limits of the Canal Conservancy, is only so much as comes also between the Toll Stations, and comprises about 18 miles, viz. 7 miles on the Circular, Entallee, and Balliaghatta Canals, and 11 miles in Tolly's Nullah, no provision of any kind is made for the Conservancy of about 45 miles of Eastern Navigation lying beyond the Toll Stations, viz. 36 miles between Dhapa and Hussainabad, and 9 miles between Panspota and Tarda, but a proposal from Mr. Heatly, a Government Grantee in the Sunderbuns, to take the former under his own care, has already been forwarded to the Superintending Engineer, and as the latter part has not hitherto required any looking after, as far as my experience goes, it may be sufficient occasionally to send a couple of Burkundazes from Tolly's Nullah to look out for wrecked Boats, &c., between Panspota and Tarda.

4. The present establishment consists of 2 Jemadars at 11 Rupees each, and 11 Burkundazes at 5 Rupees each, for 18 miles above-mentioned, and the establishment now recommended (included the occasional patrolling Eastward of Panspota also), is 1 Purwana-Nuvees or Assistant Persian and Bengallee Writer, at 16 Rupees, 2 Jemadars at 11 Rupees, 2 Mohurirs at 8 Rupees, and 20 Burkundazes at 5 Rupees—of whom the Assistant Writer would remain at the Canal Office, 1 Jemadar, 1 Mohurir and 12 Burkundazes would be posted

Superintendent of Canals to Magistrate 24-Pergunnahs, No. 82, of 4th July 1839.

Magistrate 24-Pergunnahs to Superintendent Canals, No. 284, of 26th August 1839.

on Tolly's Nullah, and 1 Jemadar, 1 Mohurir, and 8 Burkundazes on the Circular, Entallee and Balliaghatta Canals. This Establishment would prevent the necessity of calling for the assistance of the Police of the 24-Pergunnahs, except

in extreme cases, the propriety of which is obvious from the accompanying copy of correspondence with the Magistrate of Allipore.

5. It appears by the accompanying Comparative Statements, that during the eleven months I have had charge of the Calcutta Canals, the Revenue derived from the Tolls has increased upwards of 15,000 Rupees, and that the amount of Boats paying Toll has also increased upwards of 10,000 Rs. besides Canoes, while the monthly Cost Collection has been reduced from 151 to 594 Rupees, including Office Rent, &c., even with the addition of one Assistant Writer, 2 Mohurirs and 9 Burkundazes above recommended, the total cost of collection will only amount to 671 Rupees, or 20 Rupees per mensem in excess of the former establishment.

6. The great amount of extra work, both at the Canal Office and at the different Toll Stations, is evident from the fact that within the last eight months the number of Boats paying Toll has been increased 15,000, of which an excess of 8731 Rs. is due to the last three months, and within the same three months 12,136 Canoes have paid Toll, no account of which was ever before taken, so that during the last quarter ending 31st December, 1839, (upwards of 20,000 Toll Tickets have been registered in excess of former issues, and an addition of 12,000 Rupees has been made to the Revenue.

7. Though the Military Board were unremitting on a former occasion to recommend any personal allowance to be granted to the Collector of Toll, yet when they consider the very great and successful exertions that have been made to put this department into an efficient state, and to improve the Revenue, it is to be hoped that some mode of remuneration may eventually be found which would meet the approval both of the Military Board and of Government.

I have, &c.,

(Signed) A. H. E. BOILEAU,

Capt. Engineers, Collector of Tolls & Supt. of Canals.

No. 613. a.

Comparative Statement of Establishment.

	Former.			Present.			Proposed.			Expende.
	No.	Expende.		No.	Expende.		No.	Expende.		
OFFICE ESTABLISHMENT.										
Writer at 24,	1	24		1	24		1	24		
Ditto at 20,	1	20		1	20		1	20		
Ditto at 16,							1	12		
Ditto at 12,	1	12		1	12		1	12		
Chuprassee at 6,	1	6		1	6		1	6		
Office Rent.		37			37			37		
Total,		99			99			118		
COLLECTING ESTABLISHMENT.										
Collector at 150,	1	150								No alteration is recommended unless the Collector of Tolls may be thought entitled to remuneration.
Darogah at 100,	2	200		1	100					
Ditto at 75,	1	75		1	75					
Ditto at 55,				1	55					
Ditto at 50,	1	50								
Ditto at 45,				1	45					
Mohurirs at 8,				4	32					
Ditto at 6,				4	24					
Ditto at 5,				1	5					
Koyal at 4,				5	20					
Piada at 4,				5	20					
Ditto at 3,				6	18					
Dandees at 3,				8	24					
Total,		475			418			418		
CONSERVATIVE ESTABLISHMENT.										
Jemadars at 11,	2	22		2	22		2	22		
Mohurirs at 8,							2	16		
Burkundazes at 5,	11	55		11	55		20	100		
Total,		77			77			138		
ABSTRACT.										
Office Establishment,		99			99			99		
Collecting ditto,		475			418			418		
Conservative ditto,		77			77			138		
Grand Total,		651			594			671		

No alteration is recommended unless the Collector of Tolls may be thought entitled to remuneration.

No. 613. b.

Comparative Statement of Collection.

Month.	1838.			1839.			Increase.			Decrease.		
	Rs.	As.	P.	Rs.	As.	P.	Rs.	As.	P.	Rs.	As.	P.
February,	8,946	14	9	6,126	13	9	0	0	0	2,820	1	0
March,	9,240	7	0	6,947	9	9	0	0	0	2,292	13	3
April,	5,645	1	6	5,121	0	3	0	0	0	524	1	3
May,	6,439	8	0	7,577	13	3	1,138	5	3	..	0	0
June,	4,976	1	0	6,325	2	3	1,352	1	3	..	0	0
July,	4,976	4	9	7,205	12	0	2,229	7	3	..	0	0
August,	5,005	4	5	7,219	10	6	2,214	6	1	..	0	0
September,	4,469	6	6	6,884	7	0	2,415	0	6	..	0	0
October,	5,646	9	6	9,101	0	3	3,454	6	9	..	0	0
November,	5,638	3	0	8,621	1	6	2,982	14	6	..	0	0
December,	5,045	2	7	10,696	8	9	5,651	6	2	..	0	0
Total,	6,625	15	0	81,826	15	3	21,437	15	9	5,636	15	6
Deduct Decreased,							5,636	15	6			
Total Increased, Co's. Rs. ..							15,801	0	3			

No. 613. c.

Comparative Statement of Boats.

Month.	1838.		1839.		Increase.		Decrease.		Canoes entered at Russia.
	Large.	Small.	Large.	Small.	Large.	Small.	Large.	Small.	
February,	7,596	2,399	6,030	1,302	1,565	1,097	} Not Registered until October 1839.
March,	8,926	2,650	6,154	1,479	..	..	2,772	1,171
April,	4,755	2,295	4,507	1,275	..	..	248	1,020
May,	4,945	1,769	5,835	1,179	890	..	..	590
June,	4,253	1,692	5,745	1,100	1,492	..	..	592
July,	4,864	1,688	5,850	1,031	986	..	..	657
August,	4,589	1,531	6,210	1,465	1,621	..	..	66
September,	5,371	1,556	6,730	1,473	1,359	..	..	83
October,	5,313	1,540	7,888	1,361	2,575	..	..	179
November,	5,617	1,667	8,059	1,485	2,242	..	..	182
December,	5,275	1,593	8,989	1,613	3,714	19	..	..
Total,	61,503	20,380	71,997	14,762	15,079	19	4,585	5,627	12,136

(Signed) A. H. E. BOILEAU,
Capt. Engineers, Collector of Tolls.

(No. 614 omitted.)

No. 614. a.

No. 253.

FROM CAPTAIN A. H. E. BOILEAU.

Superintendent of Canals.

TO THE OFFICIATING SUPERINTENDING ENGINEER.

South-Western Provinces.

SIR,

Calcutta : 18th December, 1839.

In obedience to your letter No. 1179, dated 7th October last, and the Military Board's letter No. 2974, dated 4th October 1839, I have the honor of forwarding to you the results of my observations and enquiries respecting the Kamapohkureea Dam since my return from sea, and beg to apologize for the delay that has arisen in drawing up this report, in consequence of the accumulation of office work resulting from my temporary absence.

2. The Dam in question was built by Captain John Thomson, in a very substantial manner, between two steep banks of stiff earth, and was well protected by ballast on the side opposed to the flood-tide, but the upper side of the Dam was left without any such ballast, in order that the silt brought down by the Nullah might be deposited there, and gradually raise the bed of the Khal to a level with the top of the overfall.

3. On taking charge of this Office in the month of February last, it was explained to me by Captain J. Thomson, that the top of the above-mentioned overfall was 10 inches below its proper level, and was not sufficiently fastened to the string-pieces or ribband-beams running athwart the overfall near the heads of the piles composing it; he also explained to me that wooden slabs should be driven down like rough sheet piling, at the back of the vertical interstices between the cheek and wing piles, and that these should be again backed with mats and an additional quantity of earth to prevent any farther leakage.

4. All this was done by myself, as directed by my predecessor, previous to the setting in of the rainy season: that is to say, the piles of the overfall were driven ten inches lower in the centre, and gradually less towards the flanks; an iron bolt being driven through the head of every pile to make the overfall as firm as possible. The cheeks, &c. were secured with slabs in the manner above-mentioned, and it was hoped that the Dam would remain uninjured during the whole of the rainy season.

5. In the middle of August however, it was reported to me, that some of the piles had given way, and Mr. Assistant Overseer Conell was immediately directed to proceed to the spot and examine into the extent of the mischief. Mr. Conell found that some of the shorter piles at the junction of the west wing with the Bank were displaced, but the water being then nearly on a level with the top of the Dam, the total extent of the mischief was not then apparent, nor did I ascertain until my return from sea on medical certificate, that the waters of the Nullah had found their way round both ends of the Dam, though principally at the west side, where a channel 12 feet wide has been formed by the current, as exhibited in the annexed sketch.

6. This unfortunate occurrence (which might perhaps have been prevented had I been in a fit condition to look after the Dam) has prevented Captain J. Thomson's plan from having a fair trial, though a considerable quantity of silt has certainly been intercepted on its way down the Nullah and deposited at the back of the Dam, there being formerly about 7 feet of water just behind the overfall, where there are now but $3\frac{1}{2}$ feet, as shown in the accompanying section.

7. Some of the silt so deposited has of course been scoured away by the current setting round the end of the Dam, and a part of the western Bank has also been cut away, the debris of which has formed a shoal within the mouth of the Khal, on its eastern edge, and close to its confluence with Tolly's Nullah, but without impeding the navigation of the latter Channel.

as far as I have yet been able to ascertain, and it will be seen by the two sections, one taken immediately above the Dam, and the other 60 feet below it, that no great injury has as yet been done to the bed of the Khal, though prompt measures ought to be adopted for restoring the Dam to its original state.

8. My attention has been directed in the Military Board's letter No. 2974, above quoted, to the effect which the Dam may have had on the small traffic carried through the Khal and on the Drainage of the country. With respect to the traffic it appears that no account was formerly taken of the number of Canoes frequenting this Creek, but since I have caused this account to be taken, their number has been as follows: viz. in the month of October last 3,291 Canoes, and in November 2,855, averaging 3,073 Canoes per mensem, so that the amount of traffic upon the Khal appears to be very considerable, notwithstanding the obstruction of Dam, which is however a very convenient kind of trap for the Collector of Tolls, as it prevents the Canoes from slipping past without paying for their Tickets, by which a monthly sum of 400 Rupees is now brought into the Treasury.

9. With respect to the Drainage of the country, it appears that much mischief would have been done had the Dam been carried flush across the Creek without an overfall, but by this judicious provision for the passage of surplus water Captain J. Thomson has, I believe, remedied any mischief that would otherwise have occurred, though the section of the present overfall, say $18\frac{1}{2} \times 9$, or $166\frac{1}{2}$ feet of area does not appear to be quite sufficient for the intended purpose. This is evident from the current having found its way round the ends of the Dam during the freshes, but it may be easily remedied, and at no very great expence, in the following manner.

10. Let the piles which form the overfall remain exactly in their present state, but let all those piles which form the cheeks and wings of the Dam be driven down from 2 to 3 feet below their present level, and let all the remaining piles in each wing be also lowered gradually less and less, until they form nearly the following figure, which would not only give a considerable addition to the waterway during the freshes, but would also tend to divert the force of the current from the Banks towards the middle of the Dam, and prevent a repetition of the accident that has already happened.

11. To enable Canoes to pass the Dam at all times of the tides, should such an arrangement be deemed desirable, an inclined plane of wood might be constructed like the apron of a mill-fall, and stout rope or chain might be attached to two Buoys fixed at the distance of 50 or 60 feet, both above and below the Dam, so that the Canoes could at any time, by this means, warp themselves past the obstruction, for the Boatmen occasionally complain of the Dam as a nuisance, partly on account of its compelling them to remain until the tide rises above the overfall, and partly perhaps on account of its preventing them from evading the payment of Toll.

12. I am of opinion, that it would be well worth while to restore the Dam to its original condition, by renewing the five feet of damaged piling, and prolonging the Dam to each Bank, from which it is now distant 5 and 12 feet respectively, as shown in the plan. It would also conduce much to the stability of the Dam if a row of rough piling were carried obliquely up the stream from the corners of the overfall to each Bank, so as to check the tendency of the current to cut down the earth at the sides of the Khal, and should this suggestion be approved, I can prepare estimates for the work, including the squared piling, rough piling, embanking the space between the piles, and constructing the inclined plane for Boats.

I have the honor to be,

Sir,

Your obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Superintendent of Canals.

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No. 614. b.

No. 278.

FROM CAPTAIN A. H. E. BOILEAU,
Superintendent of Canals.

TO THE OFFICIATING SUPERINTENDING ENGINEER,
South-Western Provinces.

Calcutta: 3rd January, 1840.

SIR,

In obedience to your letter No. 1678, dated 27th ultimo, I have the honor of forwarding a rough Memorandum of the probable cost of putting the Dam at the Kamapoh-kureea Khal into an efficient state, the rates being taken from Bills for work done and not merely from former Estimates, viz.

22 Running feet of Dam, length of Piles					
20 feet, and 9' X 12" or 440 running feet					
of Piles, at	0	10	7	per foot,	291 0 8
22 Piles, driving and fixing, at	9	12	10	each,	215 10 4
Iron Bolts for 22 feet of Piling, at	0	9	1½	per foot,	12 8 9
61 Tons of Stone Ballast, at	0	6	10	per ton,	26 0 10
Punching down 46 Piles to an average depth					
of 1½ feet, or 69 running feet of Piles, at	0	8	0	per foot,	34 8 0
80 feet of Rough Piling, at	57	3	0	per 0/0	45 12 0
Securing Epaulements of Dam with Slabs, Mats, and rammed earth, about	200	0	0		

Total Expende of restoring the Dam, Co.'s Rs. 825 8 7

2. No account is taken in the above Memorandum of the probable cost of the inclined plane, mentioned in the 11th para. of my letter No. 253, of the 18th ultimo, because I believe it will be almost entirely covered by using wood from the old Dredging Boat instead of the 291 Rupees worth of new timber above-mentioned: should a separate charge however be incurred on account of the inclined plane, its cost may be roughly estimated as follows:—

5 Saul Timbers with workmanship, at 25 Rs. each,	..	..	..	125	0	0
2 Anchors with Buoys and chains, at 80 Rs. each,	..	..	..	160	0	0
Iron works, Nails, &c., say	..	..	..	25	0	0

Total Co.'s Rs. 310 0 0

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Captain Engineers, Superintendent of Canals.

(No. 615 to No. 618 inclusive, omitted.)

No. 619.

No. 5226.

FROM THE MILITARY BOARD,
TO THE GOVERNOR OF BENGAL.

14th February, 1840.

MY LORD,

We have the honor to submit a copy of the correspondence noted on the

*A letter No. 2974, dated 4th October, 1839, from Officiating Secretary Military Board.

A letter No. 1805, dated 16th January, 1840, from Officiating Superintending Engineer, South-Western Provinces, with two enclosures.

A letter No. 319, dated 12th instant, from Captain Boileau, with a Section.

margin,* relative to the examination of the Kamapookooriah Dam, and the injury which it has recently sustained, together with a rough estimate of the probable cost of placing the Dam in an efficient state.

2. The amount originally sanctioned by Government for the Dam in question, in Captain Thomson's Estimate No. 98, Book B. of 1837-8, was Rupees 2780. When Captain Thomson made over charge of his office to Captain Boileau, his Bill for the portion of work executed by him amounted to Rupees 1,946-14-1, and Captain Boileau's Bill for the subsequent completion of the work amounted to Rupees 184-0-2½, making the total expenditure for the execution of the entire work Rupees 2,130-14-3¾, or by Rupees 649-1-8½ less than the sanctioned amount.

3. The injury which the Dam has sustained is stated to be owing to the [water] having found its way round the end, and to have cut into the bank, and caused some of the piles to give way. The roughly estimated cost for repairing the damage is computed at Rupees 825, a sum which, together with the amount already expended, will make the total outlay 2,955 Rupees, or 170 Rupees more than was originally sanctioned.

4. We regret exceedingly, that the inability of Captain Boileau, owing to ill health, to give his attention to this work during the rainy season, should have led to the injury which it has sustained; but we are sufficiently confident in Captain Boileau's zeal and attention to feel satisfied, that nothing but causes over which he had no control could have led to the absence of such precautionary measures as might have prevented the occurrence of the accident.

5. Government having sanctioned the construction of the Dam over the Kamapookooriah Khall, its operation whether for good or evil would have been tested by this time, if the accident had not occurred. We accordingly conceive, that in order to give the work a fair trial it should now be restored as Captain Boileau proposes, and we therefore recommend that an expenditure of 825 Rupees be authorized for the completion of the work.

"Mr. McFarlan would be most unwilling to oppose the recommendation of a work of repair if the original design were in his judgement unobjectionable. He remarks however, that he had not an opportunity (from absence,) of stating to Government his objection to the design when it was originally recommended, and he should not be doing his duty were he now to withhold the representation of objections that occur to him.

"2nd. In the course of half a century during which Tolly's Nulla has existed, the silt which the Kamapookhureeya Nulla must bring with it in the rains would have gradually raised the bed of the Nulla and of Tolly's Nulla that is fed by it in despite of all digging or hand-cleansing, if the bed of the latter had not obtained a *natural depth*. The bed of the Kamapookhureeya Nulla, where it joins Tolly's Nulla, is on one plane, which plane is the natural one. We now propose to derange this, the effect of the Dam will be, if it is successful, to make the water of the Kamapookhureeya Nulla plunge from an height of five feet into

Tolly's Nulla, to excavate the floor of both Nullas below the Dam, and to throw up churs in the bed of the latter.

" 3rd. The effect of an overfall of water in the Nullas of the plains of Bengal is almost unknown, except at the Chitpore Lock-gate. The scour has excavated a pool of some 12 feet deep on the east side of the lock, which was at one time expected to be injurious to the massive structure of the lock itself, and has required the throwing in of masses of ballast stone. It seems quite in vain to suppose that an outlay of a few hundred Rupees in pile driving to form a Cross Dam will suffice to keep the water of this Nulla in its present bed. The soft earth Bank will again be eaten through, as it has been, this rains, and the Nulla will make for itself a new channel round the piles. To do the work perfectly, I should think with much deference to the professional Members of the Board, that a much larger outlay in forming side walls will be necessary.

" 4th. But the more perfectly the work was done the more I should object to it. The agricultural classes have had notice, it is believed, of what was to be done, and no one objected, yet it is only necessary to visit the spot and to hear the loud and angry remonstrances of the people engaged in the trade that passes through this Nulla, to make one pause in thus obstructing their traffic. Boats and salties pass at high-tide; they are tempted to try the passage before and after, and one may see them sticking miserably on this Cross Dam. What is the proposed advantage? To check the deposit of silt in Tolly's Nulla? I believe that this Nulla brings down none that it does not clear away. The great deposit in Tolly's Nulla is to the east or Tarda side of the opening of the Kamapookhurecya Nulla. It is caused mainly, no doubt, by the meeting of the tides, but this Nulla runs west to the Hooghly, and in that space, about 4 miles, there is no very serious deposit. The deposit which does take place at Tolly Gunge and the Russa Police Station, may perhaps be in some measure attributed to the Khall, but it is probable that this may be the effect of a slight back-water which would exist as much with the Dam as without it.

" 5th. If again, this Nulla brings down much silt, the effect of a successful Dam will be to raise its bed, and it is impossible to suppose that this raising will not be attended by obstructed drainage at some point probably far removed from the mouth of the Nulla. It is believed to extend more than 20 miles into the interior, and if its floor is raised only 5 feet, the effect of that may be considerable on remote tracts. It is vain to suppose, that the inhabitants of those tracts can have seen our advertisements on the subject, or could guess the effect of the measure if they had seen them.

" 6th. We must not forget, that in this country, at the present time, those Nullas form the high Roads. Kamapookhurecya Nulla is the high Road for the traffic of a large tract of country. I cannot help feeling strong regret when I see the highway of the poor trader molested for objects that advantage no one.

" 7th. The Board were not friendly to the principle of this work when it was first proposed. Captain Boileau's present letter is confined to suggestions for doing what was proposed, more effectually. He nowhere advocates the work. I think the substance of the above remark should be put to him and his opinion, and that of the Superintending Engineer, on the facts and views there given, should be called for.

" 8th. It is even now suggested, that if the effect of the work is bad, the Dam may hereafter be destroyed. I would much rather not see it made. It will not be easy to draw piles bedded deep in silt, and the effect of a rush of water on the silt deposit will be to create an unusual and unnatural deposit in Tolley's Nulla, which it may take years of the natural working of the Nulla to clear away."

6. The majority of the Board, with reference to the Minute of Mr. McFarlan above inserted, beg to observe as follow. The first objection urged by Mr. McFarlan is, that the construction of the Dam will cause the water of the Khall to plunge from the overfall down a depth

of 5 feet into Tolly's Nullah, and consequently excavate the floor of both streams and throw up churs in the bed of the latter.

7. To this may be replied, that the lower side of the overfall is protected by a bed of stones expressly to prevent this effect. The overfall was raised in February last. The rains of last season commenced in May, the Dam continued uninjured till August, and the Sections lately taken give no indication of any such effect having taken place or of its being likely to happen.

8. Mr. McFarlan states in the second place, that saltces are seen "miscrably sticking on the Cross Dam" from the Boatmen trying to pass at wrong times of the Tide, such accidents may possibly happen, from the attempts of Boatmen to do what they have no good reason for supposing themselves able to effect, but we believe that these accidents are not frequent, indeed, one saltce sticking on the Dam would prove a very sufficient beacon to warn others from attempting to follow the example, and we believe it reasonable to suppose, that these accidents would only occur while the Dam was a new work, and that they would entirely cease as the navigators gained experience.

9. The arguments regarding the Khall clearing away all the silt it brings down, are, we conceive, scarcely any thing more than an assumption of what Mr. McFarlan considers likely to be the case. They are directly opposed to the statements of the late Executive Officer Captain Thomson, whose express business it was to attend to this subject, and who has asserted that the silt brought down by the Khall did form a deposit in Tolley's Nullah, which could not be effectually removed by dredging or excavation by hand, while Captain Boileau asserts, that much silt has already been intercepted by the Dam, the majority of the Board do not consider a mere opinion of sufficient force to invalidate the report of the Executive Engineer as founded on his own observations. The correctness of the one or other view would soon be tested by the operation of the Dam, and accordingly the completion of the experiment (for it is nothing more) is recommended. These observations also apply to the remark of the Chief Magistrate regarding the obstructions to the drainage of the country, for which indeed the central opening in the Dam is expressly intended to provide.

10. The obstruction of the high Road, as it is termed, may perhaps exist to a certain extent, Captain Boileau however states, that though he cannot ascertain into what extent the Khall was formerly navigated, the traffic on it is certainly considerable now. Captain Thomson in 1837, stated that Boats could then enter the Khall during three hours of each Tide. Saltces can do so now for the same length of time.

11. No fewer than 6,000 such Boats passed down the Khall in December, the high Road therefore is certainly not closed, nor is it likely that any greater delay is caused by the Dam than is occasioned by the Locks on the Chitpore or the Circular Canal.

12. The majority of the Board do not at all concur in the opinion expressed by Mr. McFarlan, as to the difficulty of removing the Dam if it should be found necessary to do so, and accordingly in consideration of the opinion expressed by the late Superintending Engineer Col. Tickell and the Executive Engineer Captain Thomson, in favor of the construction of the Dam, and the corresponding opinions of their successors Captain Crommelin and Captain Boileau, in favor of its completion. The majority of the Board cannot withhold their recommendation as stated in the former part of this letter, that the Dam should have its fair trial, and that the works recommended by Captain Boileau should at once be carried into execution at an expence of 825 Rupees.

We have, &c.,

(Signed) D. McLEOD.
 „ D. McFARLAN,
 „ A. IRVINE.

No. 620.

No. 5328.

To CAPTAIN BOILEAU.

Superintendent of Canals.

SIR,

I am directed by the Military Board to acknowledge the receipt of your Letter No. 285, of the 13th ultimo, and in reply to mention that, although the Board are generally unwilling to recommend increase of establishments, they will nevertheless forward your proposals to Government, with their recommendation of a further trial to the end of the present half year, should you then consider the proposed increase either wholly or in part indispensable.

2nd. In the meantime the Board wish you to continue for the present to carry on the duty with the establishment heretofore allowed. They desire me however to point out that they cannot but entertain serious apprehensions of abuse on the part of the Jemadar and Burkundaze who appear authorized to demand an inspection of Tickets from Boats passing through the Canals while between the Toll Chowkees, and they trust that you will take the greatest care in preventing this authority from being abused.

3rd. Regarding the 7th paragraph of your Letter under reply, I am directed to remind you, that the Government have already decided that point, and that the Board decline all deviation from the orders already issued.

MILITARY BOARD OFFICE :
14th February, 1840.

I have, &c.,
(Signed) H. DEBUDGE,
Officiating Secretary Military Board.

(No. 621 to No. 624 inclusive, omitted.)

No. 625.

No. 1674

FROM CAPTAIN J. A. CROMMELIN.

Officiating Superintending Engineer, South-Western Provinces,

To THE OFFICIATING SECRETARY MILITARY BOARD.

Camp Keerpoy : 27th December, 1839.

SIR,

With reference to the 3rd paragraph of your letter No. 4102, of the 10th instant, directing me to call upon Captain Boileau for specific information as to the extent of advantage likely to be derived from the construction of a pukka Road on the South Bank of the Balla-ghatta Canal, I do myself the honor to submit the enclosed letter No. 259, of the 20th instant, from the above-mentioned Officer.

2. Until the Docks be more frequented, Captain Boileau considers that no advantage would attend the formation of the pukka Road, and recommends merely an outlay sufficient to render the cutcha Road passable at all seasons of the year.

3. My own opinion is, that it is somewhat unreasonable to expect whilst the Dock Roads and the Road in question remain in their present condition, that the Docks themselves will be resorted to.

To improve the Dock premises by rendering the Roads pukka; to open a permanent rapid means of communication with the capital; these must be the preliminary measures to induce location and resort. Whether an adequate return for the outlay may be reckoned upon I cannot say; at all events, the Docks in their present state appear useless, and the expended capital unproductive.

4. Captain Boileau's Estimate provides for two bricks flat under a layer of khoah; a single brick might be tried, and if laid at a very dry season of the year, will, I think, be found to answer sufficiently well. This would make a considerable reduction in the estimated expence. I cannot however recommend any expenditure beyond that above suggested by the Executive Officer unless the improvement of the Dock premises be at the same time taken into consideration.

I have the honor to be,
Sir,
Your obedient Servant,
J. A. CROMMELIN, *Captain,*
Offg. Supg. Engineer, South-Western Provinces.

No. 625. a.

No. 259.

FROM CAPTAIN A. H. E. BOILEAU,
Superintendent of Canals,

TO THE OFFICIATING SUPERINTENDING ENGINEER,
South-Western Provinces.

Calcutta : 20th December, 1839.

SIR,

In answer to your letter No. 1616, dated the 14th instant, calling upon me for specific information as to the extent of advantage likely to attend the construction of a *pukka* Road on the South Bank of the Balliaghata Canal, I have the honor of informing you, that until the Balliaghata Docks are more frequented than at present (there being but three or four Boats there on the occasion of my last visit to that place), I do not consider that any advantage would occur from the construction of this Road, nor would I recommend any outlay to be incurred at present beyond the trifling repairs required to keep the *kucha* road passable at all times of the year, for the accommodation of the few carts that pass between the Koolia Bridge and the Balliaghata salt works and Docks.

I have the honor to be,
Sir,
Your most obedient Servant,
A. H. E. BOILEAU,
Capt. Engineers, Superintendent of Canals.

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No. 626.

No. 4864.

FROM THE SECRETARY TO THE MILITARY BOARD,

To CAPTAIN BOILEAU,

Superintendent of Canals.

SIR,

24th January, 1840.

With reference to your letter No. 259, of the 20th ultimo, to the address of the Superintending Engineer, regarding the construction of a pukka Road on the south Bank of the Canal, I am instructed by the Military Board to call your attention to the inconvenience which was supposed to arise from the continuance of Boats for any length of time in the Canal.

2. This inconvenience was one of the chief reasons from constructing the new Docks, and the Board wish you to state whether the inconvenience is still felt, and if so, whether you would recommend that Boats after a certain time be compelled to quit the Channel of the Canal, and either proceed to the Docks, to the main River, or to the Lake.

3. If the Boats are compelled to enter the Docks rather than remain in the Canal Channel, it may be found necessary to construct the pukka Road.

4. You will be so good as to send a copy of this letter and of your reply to the Superintending Engineer, for his information.

(Signed) H. DEBUDE.

No. 627.

No. 301.

FROM CAPTAIN A. H. E. BOILEAU,

Superintendent of Canals,

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 25th January, 1840.

In answer to your letter No. 4864, dated yesterday, I have the honor of stating that much inconvenience would result from Boats being permitted to remain for any length of time in the Balliaghatta and Circular Canals, and I directed the Toll Darogah at Dhapa, a few days ago, to remove all Boats lying near his Station farther towards the Salt Lake, unless they preferred remaining in the Docks or elsewhere, paying the usual demurrage.

2. The Superintendent of Canals is authorized by the Regulations to eject any Boat remaining above three months in the Canals, but it does not appear that this power has ever been enforced, nor indeed that Boats have at any time been in the habit of remaining beyond a few days at any time unless under very particular circumstances, of which the following details furnish a good illustration.

3. During the eleven months that I have been in charge of the Canals, the amount of Toll collected at Dhapa Station has been Rs. 35,493-8-6, and the amount of demurrage only Rs. 452-4-3, or less than 1·3 per cent. on the amount of Toll, and even a considerable part of this sum arises, I believe, from fines of extra demurrage imposed in the Superintendent's Office, so it would seem, that the Canal is obstructed very little by Boats remaining beyond the few days to which they are entitled.

4. It ought not to be concealed however from the Military Board, that during the same eleven months, that the Canals have been under my charge, out of 71,997 Tickets that have been issued from the four Toll Stations, 7,702 Tickets, or 10·7 per cent. have never returned to the Office; and it is reported, that many of these Tickets have been torn up, by the connivance of the former Darogahs, to avoid payment of the demurrage due upon them.

5. It is not impossible that such a practice may still occur at Dhapa Station, as out of 37,983 Tickets issued from that Station, 5,497 or more than 14·4 per cent. are missing, of which 2,131 are due to the last three months, so that I fear there is still something wrong in that quarter, notwithstanding the very great increase of Toll realized at Dhapa Station.

6. In order to take away much of the inducement for such fraud, to lessen the inconvenience to Boat owners by having their Boats removed either to the Salt Water Lake or to the River, to increase the value of the ground within the Docks, which now yield no return whatever for the expence incurred in their excavation, and to lessen the obstructions to navigation which undoubtedly exist; it might be worth while to allow Boats, after having paid Toll, to remain in the Docks without incurring demurrage, but under certain restrictions to be particularized hereafter.

7. It would not, I think, be necessary to issue any specific order for compelling any Boats to quit the Channel of the Canal, as the Conservative Establishment appear to be tolerably active (as far as their limited numbers will allow) in compelling empty Boats which have discharged their cargoes to make way for full Boats coming into the Canal; and should the above proposal respecting the Docks be approved, it would perhaps prevent many hundred Tickets from being destroyed, and be of considerable benefit to the Boat owners.

8. Should the Balliaghata Docks hereafter be much frequented by adopting the above course, which is certainly well worth trial at least, a pukka Road along the south Bank of the Balliaghata Canal would become necessary as a matter of course, and there is sufficient ground for this purpose belonging to Government without incurring the expence of purchasing additional space.

9. Copy of the Military Board's letter, and of this answer, shall be communicated to the Superintending Engineer as directed.

I have the honor to be,

Sir,

Your obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Superintendent of Canals.

No. 628.

Momorandum by the Superintendent of Canals.

Canal Office, Calcutta : 28th February, 1840.

The Baliaghata Docks have hitherto been very little occupied for the following reasons :

1st. The Superintendent has received no authority to remit the Demurrage or Rent incurred by Boats remaining in the Docks, and they have therefore no inducement to frequent the same unless on account of their containing a greater depth of water than the Baliaghata Canal, which is in some places nearly dry at ebb-tide.

2nd. The Docks are so distant from the *Aruts* or marts to which merchandize is consigned, that the owners of loaded Boats would object to their remaining so far from under their immediate superintendence. This objection does not however apply to empty Boats by which the Docks were chiefly frequented upon their first being opened, and for whose occupancy in fact they appear to have been principally excavated.

3rd. No pukka Godowns or permanent buildings for Warehousing goods have been erected within the Docks, though leases have been granted rent-free to respectable Natives in the hope of their doing so ; but this is not a matter of much consequence, as the principal use of the Docks for some years is likely to be merely the preventing empty Boats from crowding the Canals, unless some means of transporting goods to the City by land carriage at all seasons of the year be provided.

4th. The want of a pukka Road leading directly from the Docks towards Calcutta, by which merchandize could be conveyed along the south Bank of the Baliaghata Canal, would naturally prevent loaded Boats from resorting to the Docks, unless for a few hours, while waiting for a tide to bring them nearer to the City.

5th. Repeated complaints have been made to the Superintendent of Canals, that Boats entering the Baliaghata Docks were shut in by closing the tide-gate, and could only make their exit twice in the 24 hours, viz. at the height of flood-tide ; but this would not signify if the Boats were to unload their cargoes there, and carry them by land along the pukka Road.

There is already a considerable amount of traffic on the north Bank of the Canal, but of course very little on the south Bank ; the amount of the latter is not exactly known, but the Superintendent has given orders to have the necessary information collected.

The following is a Statement of Boats, that have frequented the Docks since the commencement of the present system of Registry, being exactly 8 per cent. on the amount of entries at Dhapa Station.

	Entered.	Went out.	Remaining.
From 3rd to 31st March, 1839,	211	168	43
April,	232	185	47
May,	261	203	58
June,	224	175	49
July,	287	230	57
August,	339	276	63
September,	510	414	96
October, . . .	572	476	96
November, . .	266	218	48
December,	198	151 . . .	47
January, 1840,	113	687	27 or 30
Total in 11 months, ..	3,213	3,183	

the average number of entries and exits being each a little in defect of 300 per mensem.

By excusing the demurrage of Boats remaining in the Docks, their number may of course be expected to become double or triple in a very short time, and by making a pukka Road for the facilitating of traffic between the Docks and the City, much inconvenience from the overcrowding of the Canals would be prevented.

That some such provision is required for relieving the present crowded state of the Baliaghata Canal, seems evident from the following account of the number of Boats entered at Dhapa Station, during the incumbency of the present Superintendent, viz.

	Entered.		Entered.
		Brought forward, ..	18,964
February, 1839,	3,155	August,	3,495
March,	3,194	September,	3,280
April,	2,400	October,	3,713
May,	3,360	November,	3,987
June,	3,470	December,	4,544
July,	3,385	January, 1840,	5,655
Carried over, ..	18,964		
Total,			43,638
Monthly average,			3,636½

In granting permission to the Superintendent to allow Boats to remain in the Docks without paying Rent, it may be expedient also to authorize him to eject in a summary manner, or to levy demurrage at discretion upon such Boats, as may remain an unreasonable time in the Docks, to the obstruction of others, or may be likely to block up the wharfs and to injure the Banks ; or such as may resort solely to the Dock for convenience of repair.

Should the formation of a pukka Road be sanctioned by Government, the Superintendent is of opinion, that either 9 inches of khoa would suffice without other flooring or 6 inches of khoa floored with a single brick ; or even simple brick on edge without cement, in which manner 200 running feet have already been laid down on the west Bank of the Circular Canal, as an experiment.

A. H. E. BOILEAU,
Capt. Engineers, Superintendent of Canals

No. 629.

Supplementary Memorandum by the Superintendent of Canals.

Canal Office, Calcutta : 7th March, 1840.

The accompanying Abstract shows the quantity of traffic on the south Bank of Balia-ghata Canal during the past week, as adverted to in the 6th paragraph of my Memorandum, dated 28th ultimo.

Copy of this Supplementary Memorandum will be forwarded for the information of the Superintending Engineers, South-Western Provinces.

A. H. E. BOILEAU,
Capt. Engineers, Superintendent of Canals.

Statement of the amount of traffic on the South Bank of the Balia-ghata Canal, from 28th February to 5th March, 1840.

Months.	Date.	Men without loads.	Men with loads.	Unloaded Hacks.	Loaded Hacks.	Buggies.	Karanchies.	Unloaded Bullocks.	Loaded Bullocks.	Palanqueens.	Palanquen Carriages.	Remarks.
February,	28	1350	180	27	19	3	5	17	18	10	2	
..	29	1660	240	50	75	4	15	155	95	15	5	
March,	1	2005	250	75	101	9	12	65	125	12	3	
..	2	1595	201	60	225	8	17	85	95	21	1	
..	3	1740	171	55	61	5	21	225	227	13	4	
..	4	1665	131	85	91	12	24	95	91	13	4	
..	5	1357	211	82	93	9	28	102	109	6	0	
Total in 7 days,		11,372	1384	434	665	50	122	744	760	90	19	
Daily Average, ..		1625	198	62	95	7	17	106	109	13	3	

CANAL OFFICE, CALCUTTA :
7th March, 1840.

A. H. E. BOILEAU,
Capt. Engineers, Superintendent of Canals

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No. 630.

No. 6007.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE SUPERINTENDENT OF CANALS.

SIR,

24th March, 1840.

With reference to your letter No. 301, of 25th January, and subsequent Memoranda of 28th February and 7th instant, I am instructed by the Military Board to request, you will have it publicly explained that Boats are not to pay Toll for the present for remaining in the Docks. After one or two months you will be so good as to report on the effect of this order on the occupation of the Docks, and again state your opinion as to the probable utility of a pukka Road on the south Bank. In the mean time, the Board will postpone the consideration of the proposed Road, as the cost appears to be so heavy.

I am, &c.,

(Signed) H. DEBUDE.

(No. 631 to No. 640 inclusive, omitted.)

No. 641.

No. 2375.

FROM CAPTAIN J. A. CROMMELIN,
Offg. Superintending Engineer, South-Western Provinces,

TO THE OFFICIATING SECRETARY MILITARY BOARD.

SIR,

Barrackpore: 14th April, 1840.

Having transmitted to Captain Boileau a Copy of your letter No. 6255, of the 31st ultimo, I do myself the honor to submit that Officer's answer No. 380, without date, received on the 13th instant, conveying the desired information relative to the Entallee Canal and Dhurramtollah Cess-pool.

2nd. The Report is full, clear and satisfactory. Needs no remark from me.

I have, &c.,

(Signed) J. A. CROMMELIN,
Offg. Superintending Engineer, South-Western Provinces.

No. 641. a.

No. 380.

FROM CAPTAIN A. H. E. BOILEAU, *Engineers,*
Superintendent of Canals,

TO CAPTAIN J. A. CROMMELIN, *Engineers,*
Offg. Superintending Engineer, South-Western Provinces.

Canal Office, Calcutta: April, 1840.

SIR,

I have the honor of acknowledging the receipt of your letter No. 2318, of the 8th instant, with Copy of the Military Board's No. 6255, of the 31st ultimo, calling upon me for a Report as to the circumstances which have led to the heavy Estimate for cleaning the Entallee Canal, and also to explain the effect exercised by the Dhurramtollah Cess in preventing the ingress of silt into that Canal.

2nd. In order to give a full and satisfactory answer to the above queries, I have the honor of submitting for your consideration the following Memoranda, extracted from the records of this office, viz. :

" Captain Thomson states in his revised Estimate No. 5, dated 3rd February 1836, that the Entallee Canal had been excavated by his predecessor at a cost of about 5,000 Rupees, exclusive of an additional sum of 2,300 Rupees arising from the failure of the Banks!

" It also appears by Bill No. 16, dated 12th September 1836, that this Canal was again excavated at an expence of 4,521 Rupees, exclusive of 968 Rupees for the repair of the Banks and Roads, amounting in all to 5,489-1-3 and 2,987-13-6, as per Bill No. 46, dated 7th April 1837, for clearing out that part between the Koolia Bridge and the Timohancee."

3rd. If therefore the mud from the Entallee Canal in 1832 cost 5,000 Rupees, and in 1836 (four years afterwards) the same operation cost 4,500 Rupees, exclusive of nearly 3,000 Rupees in the next year, it seems obvious enough that after another four years, or in 1840, a repetition of the excavation may be expected to cost at least the same sum, and in fact my Estimate No. 14, dated the 14th ultimo, amounts to exactly 4,528-10-6, but as the work cannot be executed this year on account of the lateness of the season, it will probably cost 1,100 Rupees more to complete it after the approaching rains.

4th. It is not difficult to judge of the effect of the Dhurumtollah Cess-pool in keeping silt out of the Canal, from the fact that the Cess-pool requires to be dug out annually to a depth of six feet or thereabouts, and the length of the Entally Canal being in round numbers 4,800 feet, while that of the Cess-pool is only 200 feet or $2\frac{1}{4}$ of the former, it follows that the six feet depth of mud accumulated in the Cess-pool would cover the whole bottom of the Canal to the depth of three inches, no regard being paid to their relative sections; and thus in four years, the Cess-pool would have kept one foot in depth of mud from silting up the Canal. In reality however, the increased section of the upper part of the Cess-pool would augment this beneficial effect rather more than one-half, so that $1\frac{3}{4}$ foot of mud may be taken as the quantity kept out of the Canal by the Cess-pool in four years.

5th. Another and clearer view of this case may be taken by considering the quantity of mud actually accumulated in the Entallee Canal during the last four years, and the quantity of silt kept out of it by the Dhurumtollah Cess-pool during the same time, according to the following data :

Bill No. 1, by Captain J. Thomson, dated 23rd May 1837, for digging out 57			
Chowkas (or 41,553 cubic feet) from the Cess-pool, costing Rupees ..	453	2	10
Bill No. 43, by the same, dated 17th January 1838, for digging out 134			
Chowkas (or 9,786 cubic feet), Rupees	636	9	3
Bill No. 61, by Captain A. H. E. Boileau, dated 2nd April 1839, for digging			
out cubic feet 78,390, Rupees	484	3	8
Estimate No. 12, by the same, dated 24th January 1840, for digging out			
77,000 cubic feet Rupees,	496	0	0

6th. We have here a very fair account of the operation of the Cess-pool, which appears in four years to have caught and prevented from going into the Canals $41,553 \times 97,686 \times 78,390 \times 77,000 = 2,94,629$ cubic feet of silt, while in the same time (or rather less) cubic feet 7,22,065 of mud have actually been deposited in the Canal by the tides, according to my Estimate No. 14, dated 14th March 1840.

7th. The whole length of the Entallee Canal, including the Cess-pool, is 5,031, or in round numbers 5,000 running feet, and its sectional area between the bottom and the zero water-line is $\frac{66 \times}{2} 30 \times 6,288$ feet, so that the whole Canal would be exactly choked up by $5,000 \times 288 = 14,40,000$, or $14\frac{1}{2}$ lakhs of cubic feet of mud, and as it appears above, that 7,22,065, or $7\frac{1}{4}$ lakhs of cubic feet of mud require to be dug out at present, just one-half

of the Canal is choked up, notwithstanding that cubic feet 2,94,629 or three lakhs of cubic feet of silt have been kept out of it by the Cess-pool.

8th. The building of the Cess-pool cost $732-9-0 \times 540-7-9 =$ Rupees 1,273-0-9, (vide Bill No. 11, dated 4th July 1835, Bill No. 44, dated 22nd April 1836,) and the cost of the four excavations of mud from it, mentioned in paragraph 5, amounts to Rs. 2,069-15-1, or in other words, the removal of 3,00,000 cubic feet of mud has cost 2,000 Rupees, exclusive of the price of the Cess-pool Dam: at this rate the excavation of 7,22,000 cubic feet would cost about 4,800 Rupees, or a little more than the amount of my own Estimate.

9th. Hence it is to be inferred, either that the mud may be excavated at the same rate from the bed of the Canal as from the Cess-pool, or else that I have under-rated the cost of the former operation. But though it would thus appear that the construction of the Cess-pool has not in any way lessened the expence of digging out the Canal periodically, yet it is of decided advantage to the navigation of the Canal that upwards of 70,000 cubic feet of mud should annually be pent up within a space of 200 running feet at its extremity, rather than be allowed to diffuse itself over a considerable part of its bottom.

10th. From the many slides that have taken place in former days, and from other causes, I cannot exactly report upon the comparative quantity of silting before and after the erections of the Cess-pool Dam, but with reference to future excavations of the Entally Canal I trust that it is clearly shown from the above data, that an expence of 7,000 Rupees is likely to be incurred every four years in digging out the mud, viz. 500 Rs. per annum for the Cess-pool, and near 5,000 Rupees quadrennially for the body of the Canal.

I have, &c.,

(Signed) A. H. E. BOILEAU.

Captain Engineers, Superintendent of Canals.

(No. 642 to No. 679 inclusive, omitted.)

No. 680.

Extract of a Letter No. 166, dated 20th November, 1840, from CAPTAIN A. H. E. BOILEAU, Engineers, Superintendent of Canals, to the Officiating Secretary to the Military Board.

“In conclusion I beg to state for the information of the Board, that the throwing open of the Balliaghatta Docks for the purpose of permitting all Boats to lie there free of Rent for the purpose of preventing obstructions in the Balliaghatta Canal, has been productive of very little benefit to the public, as only 12 to 15 Boats per diem have entered those Docks, though the number of Boats passing into the Balliaghatta Canal, at Dhapa Station, within a few yards of the Dock-gate, is upwards of 6,000 per mensem.”

(No. 681 to No. 686 inclusive, omitted.)

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No. 687.

Extract of a Letter dated 29th May, 1841, from CAPTAIN A. H. E. BOILEAU, Superintendent of Canals, to the Officiating Secretary to the Military Board, recorded as No. 54, in the Board's Proceedings of the 6th July, 1841.

"Para. 8. Repeated complaints have been made during the past half-year of the obstruction experienced by Boats attempting to pass through the Circular and Balliaghatta Canals, owing to the great number of Boats frequenting that line of navigation, and the impossibility of keeping an open way from one end of the Canals to the other, with the very small Conservative Establishment now allowed for the purpose. There is not a single Burkundaz stationed along the whole line of the Circular Canal intermediately between the Chitpore Bridge and the Police Chowkee at Balliaghatta, a distance of more than four miles, nor is there a man to spare for this duty, and when it is remembered that the number of Boats plying on this line during the last six months has been upwards of 50,000, it will, I think, be found necessary to make a small addition to the Conservancy Establishment for the purpose of keeping this multitude of Boats in better order, and preserving a thoroughfare through the Canals.

"Para. 11. I had intended to have brought before the Military Board, a proposal for improving the navigation and preventing the crowding of the Circular Canal, by forming a pair of Gates under the Bridge on the Barrackpore Road, so as to convert that portion of the Canal between it and the Cheetpore Bridge into one large Lock, by which means many scores of Boats could at once be let in or out from the River Hooghly: but my time is so thoroughly occupied by numerous other avocations that I have no leisure either for drawing the Plans, framing the Estimates, or even paying proper attention to the execution of the works should they be sanctioned, so that this proposal must be postponed to some less busy time."

No. 688.

No. 47.

FROM CAPTAIN A. H. E. BOILEAU, *Engineers,*
Collector of Tolls,

TO THE OFFICIATING SECRETARY MILITARY BOARD.

Calcutta: 22nd June, 1841.

SIR,

In answer to the 4th paragraph of your letter No. 989, dated the 18th instant, I have the honor of stating for the information of the Military Board, that the present season is that time of the year in which the collection of Tolls usually falls to about two-thirds of what it amounts to in the cold weather, and consequently less business is transacted in this Department than at other seasons; I would therefore recommend that no change should be made, at least for the present, in the existing system, but that I should be allowed to wait until the commencement of the busy season to see whether the appointment of an Assistant would then be absolutely necessary or not.

2. It would not, I think, be expedient to transfer the collection of Tolls to any other office, as it is not only probable that the Revenue would fall off greatly if this were the case,

but that I should be more harrassed with appeals or suits for confiscation in my capacity of Superintendent of Canals (from which I could not be relieved except by a new Act in Council) than I am at present, as Collector of Tolls ; for if the latter office were in the hands of any other person, I should necessarily be ignorant of his proceedings previous to the cases being sent up to me for trial, and should probably have to make myself acquainted with the particulars of each by reading through long documents and perhaps entering into long correspondence, instead of settling matters at once in a summary manner, as I am now able to do with nearly the whole of the cases that are brought before me.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Collector of Tolls

(No. 689 to No. 708 inclusive, omitted.)

No. 709.

No 170.

FROM THE SUPERINTENDING ENGINEER,

South-Eastern Provinces.

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 16th May, 1842.

I have the honor to acknowledge the receipt of your letters No. 7741, of the 16th ultimo, and No. 147, of the 11th instant, and in reply to acquaint you, that on my return from Burrisaul to Calcutta, I passed through the Eastern Canals, and I propose, as soon as possible, submitting the observations I then made for the consideration of the Military Board.

2nd. But I beg to observe, that I am first desirous of concluding my other reports which, in order of date, are entitled to a priority. I have already forwarded since my return, my report on the Province of Arracan, and also on the Public Buildings in the Burrisaul Division, and directly my reports on the Comillah and Noakally Roads are completed, which I hope will be in a few days, I propose to turn my attention to the Eastern Canals. From the necessity of three copies of these documents being required, one for the Board, one for the Executive Engineer, and one for record, I really cannot get them quicker out of hand than I have done and am doing.

3rd. In the mean time however, I take this opportunity of forwarding the correspondence

No 3138, 20th April, 1842, Superintending Engineer to Captain Boileau

No 314, 30th April, 1842, Captain Boileau to Superintending Engineer

No 111, 10th May, 1842, Superintending Engineer to Captain Boileau.

No. 4, 11th May, Captain Boileau to Superintending Engineer.

and plan mentioned in the margin, between Captain Boileau and myself, on the subject of the Eastern Canals, from a perusal of which, the Board will perceive, that the Superintendent, owing to a press of other business, has not been able to visit the Muffasil

Canals since he received charge of his office from the late Captain John Thomson.

4th. Presuming that this is a state of things the Board is desirous to see rectified, I shall, in my promised report, make some proposition for the Board's consideration, with the view of enabling Captain Boileau to afford an efficient superintendence to the duties of his substantive appointment.

I have the honor to be,

Sir,

Your most obedient Servant,

W. R. FITZGERALD, *Major.*

Superintending Engineer, South-Eastern Provinces.

No. 709. *b*.

No 314

FROM CAPTAIN A. H. E. BOILEAU, *Engineers,*
Superintendent of Calcutta Canals,

TO MAJOR FITZGERALD, *&c. &c. &c.,*
Superintending Engineers, South-Eastern Provinces

Calcutta : 30th April, 1842

SIR,

I have the honor of acknowledging the receipt of your letter No. 3138, dated 20th April 1842, calling upon me to furnish Plans and Statements of the different Canals to the Eastward of Calcutta, and any other information which I may possess regarding them, in order that a Report may be drawn up for the Military Board; as no information regarding them has been received from my office since the year 1837.

2. In obedience to the above, I have the honor of forwarding a small Map, on a scale of two-thirds of an inch per mile, giving a general view of all the Canals to the Eastward of Calcutta, from the City itself for about 50 miles distance, to the Feshamuttee or Juboona River, where my superintendence is supposed to terminate; though in reality my personal control barely extends beyond the Western margin of the Salt Water Lake at Balliaghatta, and beyond the Toll Station at Panspota, about two miles East of the Bridge over Tolly's Nullah at Guria Hath.

3. Since I received charge of this Office from the late Captain John Thomson in February 1839, I have not found leisure to visit any of the Mofussil Canals; and I rather think, that my predecessor was in a similar predicament for the two years preceding the time of his being relieved by me; in fact, the duties of my different offices in Calcutta are so onerous, and require such incessant attention, that during the last two years I have not, to the best of my recollection, slept out of the Canal Office for one single night.

4. In my Report to your Office, letter No. 358, dated 25th March, 1840, a concise account is given of each of the following Canals, viz.:

No. 1. The Husunabad Canal.

„ 2. The Baley Gunj or Soolkoonia Canal.

„ 3. The Bhowaneepoor Canal.

„ 4. The Chaitul (or Chaitul-Bachra) Canal.

„ 5 and 6. The Chultabaria and Bhangor Canals.

„ 7, 8 and 9. The Ghooneemagee, Bhojdigee, and Bamunghata Canals:

but as it may not be convenient to refer to that Report, an Extract from it is appended to this letter.

5. The late Captain J. Thomson informed me verbally, that owing to the meeting of the tides in one of the most distant Canals, (that of Bayley Gunj?) it would probably become so far silted up in the course of a short time, as to require being cleared out; but I hear no complaints of any stoppage taking place in that Canal on account of the formation of Mud-Banks; and I am in hopes, that the navigable Channel may be continually kept open by the unequal action of the currents which scour its bed.

6. By *unequal action* I would be understood to mean, that where opposing tides invariably meet each other at the same point in a Canal, they are almost sure to form a dangerous Bank or bar at that point; but where their point of meeting is variable, it may happen that the reflux of that tide which ebbs over their former point of meeting, will scour away the silt which may formerly have been deposited there.

7. I was also verbally informed by the late Captain John Thomson, that some thousands of Rupees had been ineffectually expended in attempting to dam up the Gobra Khal, near the West end of the Bayley Gunj Canal, probably to prevent its tides from meeting those of the Kulloar Gong, which crosses the East end of the same Canal : but he explained to me that a part of the Gobra Khal might eventually be required to be taken into the line of navigation, should it be found necessary to abandon the Eastern portion of the Bhowaneepoor Canal, which runs through a bad sandy soil.

8. My predecessor had, I believe, some thought of recommending that only the Western portion of the Bhowaneepoor Canal should be allowed to remain as at present, and that the Eastern portion should be made to strike into the Gobra Khal about three-quarters of a mile below the West end of the Bayley Gunj Canal, which would involve about one mile of cutting ; and would require Boats to run up the Gobra Khal with the flood-tide instead of dropping down it with the ebb.

9. Another alteration has been proposed by Mr. Heatley, of Meredith's Buildings, Calcutta, the proprietor of a considerable portion of Soondurbun land, copy of whose proposition was forwarded to your Office with my letter No. 283, dated 9th January 1840, to which I beg to refer you. I may as well briefly state, however, that Mr. Heatley's proposal was to save nearly 24 hours' navigation through the Chaitul-Bachra Canal, the Tuttooa Khal, the Khetooamumora and Aktratulla Khals, by cutting a Canal a mile and a half long through his own lands, between the South end of the Khujootulla Khal and the South-East end of the Aktratulla Khal.

10. At the time of forwarding Mr. Heatley's proposal, I had purposed paying a visit to the Soondurbuns for the purpose of examining the Mofussil Canals, but I have never yet found an opportunity of doing so, as already mentioned in the 3rd paragraph of this letter : nor do I see a prospect of my being able to do so, and it would, I think, be advisable to attach another Overseer to this Department to look after those Canals : or rather to employ an Assistant of a superior order, who should understand surveying and the taking of levels, as well as the ordinary work required from Assistants in the Department of Public Works.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers. Superintendent of Canals.

CANALS.

No. 1. The Hussnabad Canal, in the district of 24-Purgunahs.

No. 2. The Bayley Gunj Canal, (or Sookoonia Khal?) 24-Purgunahs

No. 3. The Bhowaneepeer Canal, 24-Purgunahs.

No. 4. The Chaitul Canal, in the 24-Purgunahs.

Nos. 5 and 6. The Chaltabaria and Bhongor Canals, 24-Purgunahs.

Nos. 7, 8 and 9. The Ghooneemagee, Bhojidgee and Bamunghata Canals, 24-Purgunahs.

This Canal is distant 45 miles east from Calcutta, and extends from the Eeshamuttee River to the Dansar Khal: having about 5,000? feet or one mile of cutting, 80 feet in width.

This Canal is distant about 40 miles east of Calcutta, and extends from the Chandpoor Khal or Kallaoir Gong to the Gobra Khal: its length being 6,775 feet or $1\frac{1}{4}$ miles, and its width 80 feet.

This Canal is distant 35 miles east from Calcutta, joining the Gobra Khal to the Akratulla or Hinshee Khal: its length is 10,830 feet, or about two miles, and its breadth 80 feet.

This Canal is distant 30 miles east of Calcutta, and extends from the Tuttoo Khal toward the Choumooh Gong River, having only 3,200 feet or about 5 furlongs of cutting, 80 feet wide.

These Canals are distant 20 miles east of Calcutta, joining the Koosree and Doodbeebee Khals; they extend 16,430 feet or $3\frac{1}{4}$ miles, and are 80 feet wide, except for a distance of 3,500 feet or nearly $\frac{3}{4}$ miles (in the Bhongor Nullah), which is only 60 feet wide.

These Canals form almost a continuous line of navigation, between the Doodbeebee Khal and the last end of the Salt Water Lake, distant 15 to 10 miles east of Calcutta, and varying from 60 to 80 feet in width. The Ghooneemagee Canal is stated in the Office Records to be 7,000 feet, or $1\frac{1}{3}$ miles long and 60 feet wide; the Bhojidgee Canal is also stated to be 5,917 feet or about $1\frac{1}{3}$ miles long and 80 feet wide, and the Bamunghata Canal to be 21,136 feet or four miles long, and 70 feet wide, but these lengths are doubtful.

(True Extract.)

A. H. E. BOILEAU,

Capt. Engineers, Superintendent of Canals.

Major Schalch and Captain Thomas Prinsep, 1822-27.

Unknown.

Major Schalch and Captain T. Prinsep, 1827.

Unknown.

Captain Thomas Prinsep, 1828-29.

Sicca Rupees 27,789-10-5 $\frac{1}{2}$?

Captain T. Prinsep, 1829-30.

Sicca Rupees 4,882-7-4 $\frac{1}{2}$?

Captain T. Prinsep, 1827.

Sicca Rupees 19,229-12-11 $\frac{1}{4}$ for Chaltabaria (Bhongor unknown).

Captain T. Prinsep and James Prinsep, Esquire, 1829 and 1830.

Sicca Rupees 51,239-13-5 $\frac{1}{4}$? including for the Bhojidgee Canal 14,783-3-7 $\frac{1}{2}$.

No. 709. d.

No. 1.

FROM CAPTAIN A. H. E. BOILEAU, *Engineers,*
Superintendent of Calcutta Canals.

TO MAJOR W. R. FITZGERALD, *&c. &c. &c.*
Superintending Engineer, South-Eastern Provinces.

Calcutta : 11th May, 1842.

SIR,

In answer to your letter No. 111, dated yesterday, I have the honor of informing you, that the words "to look after those Canals" in the 10th paragraph of my letter No. 314, of the 30th ultimo, refer only to the Mofussil Canals Eastward of Calcutta, and I greatly fear, that even the appointment of an additional Overseer to look after them, would not enable me to leave Calcutta for a sufficient time, to superintend in an efficient manner, the execution of any work that might be required in those parts.

I have the honor to be,

Sir,

Your most obedient Servant,

A. H. E. BOILEAU,

Capt. Engineers, Superintendent of Canals.

No. 710.

No. 325.

FROM THE SUPERINTENDING ENGINEER,
South-Eastern Provinces.

TO THE SECRETARY MILITARY BOARD.

Calcutta : 27th May, 1842.

SIR,

In continuation of my letter No. 170, dated 16th instant, I have the honor to forward the following observations regarding the Eastern or Mofussil Canals, and Captain Boileau's management of the same, for the consideration of the Military Board.

2. Proceeding from the Eastward, the first Canal you enter is that of Hooseenabad : at the time I came through it, on the 28th of March last, I met with no obstruction whatsoever, and I do not believe that it requires any thing being done to improve it. I however passed through it at high-water.

3. My progress soon after was stopped by the state of the Bayleygunge Canal—I had to wait at its entrance for some hours until the flood-tide made, and it was not until it had been in for about two hours that I could enter the Canal.

4. It is quite dry at low-water, its bed being considerably above low-water level. It has silted up from the tides meeting in it, and except at spring-tides, must be nearly unnavigable.

5. The earth that has been excavated from the Canal, forms a good towing-path, which enabled me to get through the Cut, when the water rose, expeditiously, by tracking, notwithstanding that the jungle has sprung up afresh down near to the water's edge.

6. This Canal I look upon as a failure, and I fear it can never be rendered efficient, unless the original intention of the projecter is carried out, and the Gobrah Khall bunded up. If this were done the tide would flow more directly through the Bayleygunge Canal, instead of meeting in it, and that Canal would then probably become a navigable tide Nullah.

7. As it is, on entering the Bayleygunge Canal from the Eastward, you go in with the flood in your favor, in a short time after, when you have proceeded about a third through, you find the same flood-tide coming in from the Gobrah Khall against you. Getting over the remaining portion, on arriving at the Eastern entrance of the Canal, you find the flood a second time in your favor, until you arrive at the Northern end of the Bhowancepore Canal, where it is for the second time against you.

8. One of these alternatives of tide would at any rate be avoided if the Gobrah Khall were closed, so as to prevent its waters coming into the navigable channel of the Canals at all. The Bayleygunge Canal would then be fed by the water from the Bhowancepore Canal at flood-tide, and vice versa, and the navigation would be rendered much more complete than it is at present.

9. I am aware that a considerable sum of money was some years ago expended in an unsuccessful attempt to close up the Gobrah Khall, but perhaps the large revenue derived from the Tolls might admit of another attempt being now made to effect so desirable an object to the improvement of the navigation through the Sunderbund Canals.

10. But if this is not attempted, I cannot recommend any expenditure being incurred to make the Bayleygunge Canal navigable by excavation: it would need such expenditure yearly, and would have to be closed up just at the time it is most required, and even then, on account of the alternation of tides, would never be a satisfactory Channel. The line of this Canal is the best that could be taken for the navigation, but its efficiency is entirely dependant upon the closing of the Gobrah Nullah, and if that cannot be done, Boats must go round by some other course, as they now do, to the Bhowancepore Canal.

11. The Bhowancepore Canal I found to be perfectly navigable. The same flood-tide here, was, as I before observed, again against me, but I was enabled to proceed by tracking on the bund, though with some little difficulty, owing to the jungle on it, until I reached the Southern termination of the Canal. There is a good deal of cultivation in this neighbourhood and a flourishing village.

12. The jungle tract however recommences immediately after passing the village, and a heavy boat would have had to stop here even, if not before, but I was enabled to proceed slowly by pulling against the tide until I reached the Akrotallah Nullah. Here the flood-tide was in my favor, and continued to be so until I arrived near the Choytul Canal, down which I proceeded with the ebb, and beyond it to the village of Maundaree.

13. The Choytul Canal is very narrow, and had a rapid current in it, but it was otherwise quite efficient, and does not seem to require any expenditure to improve it. I reached Maundaree at sunset, having been about 6 hours in coming from the Eastern entrance of the Bayleygunge Canal.

14. From Maundaree I proceeded in one flood-tide, and a small portion of the ebb, or in about 8 hours, through the Chaltabaryn and Bhanguir Canals, and the Bhojdiggee and Bhamunghatta Canals, and reached Calcutta in 30 hours from Hooseenabad.

15. The Bhamunghatta Canal is, I understand, not navigable for Boats of burthen at low-water, and the towing-paths want repair, and the Banks to be cleared of jungle.

16. With the exception of the Bayleygunge Canal however, the rest may be considered in their navigable Channels as not requiring much to be expended on them, but it is desirable, that the Banks and towing-paths of all should be kept clear of jungle wherever these obstacles occur, as sometimes by being enabled to proceed against the stream for a short distance by tracking, you save the delay of a whole tide.

17. I am quite aware that what I have here said of the Canals is very imperfect, and that a much more detailed account of them is required to give the Board a correct idea of their real condition. It is true that I passed through them in not a very light Boat, and reached Calcutta in 30 hours from Hoosceenabad, which speaks much in their favor, but then it must be remembered, that this was done under the favorable circumstance of a strong spring-tide. During the neap-tides this rapid progress could scarcely have been effected, and it is desirable, that the state of the Canals, at all times of tide, should be known before their general efficiency can be pronounced upon.

18. With respect to Captain Boileau's management of this portion of his duties, I need only mention, that that officer considers "his personal control barely extends beyond "the Western margin of the Salt Water Lake," and that he has not, from his various other avocations, been able to visit the Mofussil Canals once since he took charge of his present appointment, about 4 years ago, to give the Board some idea of the existing state of things. There is not perhaps much that would constantly require the Superintendent's attention in the Mofussil, but at the same time the Canals should not be altogether neglected, and I certainly think, that if they are to remain under Captain Boileau's charge, he should be placed in a position to afford them an efficient superintendence.

I have the honor to be,

Sir,

Your most obedient Servant,

W. R. FITZGERALD, Major,

Superintending Engineer, South-Eastern Provinces.

(No. 711 omitted.)

No. 712.

Extract of a Letter No. 25, dated 30th May 1842, from Superintendent of Canals, to the Secretary to the Military Board.

"14. In the Mofussil Canals, or those far to the Eastward of Calcutta, should any obstruction occur on account of there not being sufficient water except at high-tides, I am given to understand that Boats can often find other ways of going to the place of their destination; but this is not the case in the immediate neighbourhood of Calcutta, where any great operation, either in excavating, dredging by steam, or putting up extra Lock-Gates, would cause a serious obstruction, if not a total stoppage of the traffic,* either on the Circular Canal or on Tolly's Nullah, while such work was in progress. The cutting a new Canal from Entalce, at the South end of the Circular Canal, into Tolly's Nullah at Bhowanceepoor, would remedy this in a considerable degree, but it would cost many Lakhs of Rupees, which can ill be spared at present, though such a Canal might eventually yield a large income.

* And consequently a great loss of Revenue. —J. M.

"26. It is desirable that some improvement should be made in the manner of raising sunken Boats, some of which lie so long in the water as to become serious obstructions to the navigation; but I am now endeavouring by mounting the Cheetpoor Log Dam Gins upon wheels, and filling them with crabs to form a kind of moveable engine, that may be taken to any part of the Balliaghatta, Entalce or Circular Canals, to assist in raising wrecked Boats, and I hope soon to get this machine into good use. The traffic on Tolly's Nullah is far less than on these Canals; but should the wrecks and sunken Boats on that line of navigation become troublesome, other means must be devised for clearing them away from the fair-way Channel."

(No. 713 to No. 752 inclusive, omitted.)

cclxxxviii

No. 753.

No. 345.

To MAJOR DEBUDE,

Secretary Military Board.

SIR,

I have the honor to submit the following case for the consideration of the Military Board, with a view of having a defined limit, that the possession of a Ticket paid for at Dhappa, entitles a traveller to proceed to, free of further toll, the demurrage on account of time in this instance not applying. An officer on duty proceeding to Rungpore, paid the proper toll of 8 Rupees at Dhappa, and received a Ticket to pass him clear of the Government Canals, but falling sick on the day following, he was obliged to return, not having gone out of the Canal East of the Salt Water Lake, and on his return was charged 8 rupees more to pass him into the Hoogly.

In Clause II. of Act No. XXII. of 1836, the line of Canal is said "to be made up of the Channel across the Lake, to Bhaminghatta, of the Canal from the Lake to the Boitakhana Road, and of the Circular Canal into the Hoogly."

From which it would appear, that the holder of a Ticket is entitled to remain within the above limits free of further expence, and going in any direction, provided he does not exceed the time allowed for each description of Boat, when of course demurrage would be leviable, and the Bhaminghatta Canal at its Eastern extremity forms so complete a boundary, to what may be termed the Calcutta Canals, in contradistinction to the Eastern lines, a nine mile Channel of Sunderbund intervening, that I am of opinion, such limit may be fairly laid down, and beg to submit the same for sanction, as also, in that event, to return the second toll paid by the officer.

I have further to solicit instructions relative to officers proceeding on duty, whether toll is leviable from them or not,

And have the honor to be,

Sir,

Your obedient Servant,

CANAL TOLL COLLECTOR'S OFFICE :

22nd April, 1843.

H. GOODWYN, Captain,

Offg. Collector of Tolls.

No. 754.

No. 281.

FROM THE SECRETARY TO THE MILITARY BOARD,

To CAPTAIN GOODWYN,

Offg. Collector of Tolls.

SIR,

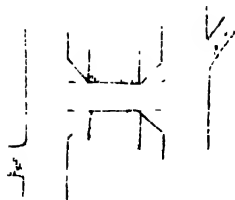
12th May, 1843.

In acknowledgment of your letter No. 345, of the 21st April last, relative to the limit of the Canals free to the holder of a Ticket, I am directed by the Military Board to mention, that under the circumstances of the case brought forward, they authorize the amount of the second toll levied being returned, and desire me to observe, that their present decision must not be made a precedent for future remissions; but orders must be solicited on every similar case.

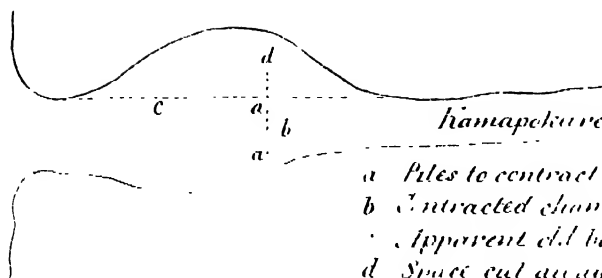
2. With reference to the last paragraph of your above communication, the Board desire me to annex the Government Circular Orders of the 27th May 1839,* for your guidance.

I have, &c.,

(Signed) H. D.



Tellus Villah



kāmapokureah khall

- a Piles to contract stream*
- b Contracted channel causing a greater rush*
- c Apparent old bank*
- d Space cut away where water now flows*

No. 755. a.

No 355.

FROM CAPTAIN H. GOODWYN, *Engineers.**Officiating Superintendent of Canals.*

TO MAJOR W. R. FITZGERALD,

*Suptdg Engineer, South-Eastern Provinces.**Calcutta, Canal Office: 23rd April, 1843.*

SIR,

I have the honor to annex the following Report, the result of an inspection of the Canals East of the Salt Water Lake, and also of Tolly's Nullah. I proceeded on the 17th to the extremity of the line, viz. to Huseinabad, the junction with the River Issamutty, with a view of examining the lines in detail on my return. There have been no plans or sections of these Canals made over to me in the office, so that my Report cannot be completely comparative, but principally confined to the statement of the Canals as they are.

2. The Circular Canal is generally in good order, a few slidings of the banks having to be repaired. The Cheetpore Lock-Gate has been repaired, and is fixed again in its position.

State of Circular Canal and repair to Bridges pointed out.

The *khoah* from the Roadways of the Barrackpore, Dum-Dum, Nurkuldunga and Baliaghata Bridges have been worn away, and require re-metalling directly.

The approaches to the Ooltadungah and Manicktollah Bridges require raising, as their brick platforms are 6 inches above the road on either side, the chains of the former Bridge now form an impediment from the circumstance of the wing-walls curving outwards from the standards: a railing is necessary from the foot of the

Ooltadungah Bridge—approaches are dangerous.

(A.) Refers to a note at the end of the Report.

chains to the wing-walls to prevent accidents.

(A.) The standards of this Bridge have each a horizontal crack at the level of the parapet, apparently from the effect of the chains being hung inside the line of gravity; giving the piers a tendency towards each other—when chains are hung in this manner the standards should be connected at their summits by an arch. Many Road tracks of the Cheetpore Bridge are gone, and many worn, 50 new ones are requisite, and are now making.

A portion of the Bund (pucka Road) made some time ago, along the North Bank of the Baliaghata Canal, has been worn away, and requires repair before the rains.

The several Drains along the Circular and Entalce Canals require cleaning out.

The Cheetpore and Dhapa Chowkey Toll-houses require partial repairs, as do also the steps of the Ferry on the North Bank of the Baliaghata Canal, many of them being quite destroyed.

Toll Houses require repair.

An Estimate was forwarded by me with my No. 320, of 14th April, for repairs to the South Bank of this Canal.

3. The Entalce Canal was reported on in my letter No. 331, of 13th April. The cause of the deposit is principally owing to the tide, which at the flood from the Hooghly and ebb from the Lake, finds its way so sluggishly along the Entalce Channel, that the deposit is great, this would not be the case were there an outlet from the SW. end through to Tolly's Nullah near Guriah Hath. The Estimate for the Entalce clearance is prepared, and will be forwarded directly.—(P. S. has been submitted.)

Entalce Canal reported on.

4. A Tow-path was constructed in 1833 on the South-Western Bank of the Lake Channel, for the benefit of the import trade during certain parts of the year, and for the export during the prevalence of the strong Southerly winds. It requires to be repaired and raised in some places, as its utility is great.

5. I proceeded from the Salt Water Lake direct to Huseinabad to inspect Westward, as in returning my route would be through Tolly's Nullah. Proceeded to Eastern limit of Huseinabad Canal. At the mouth of the Huseinabad Canal, at its junction with the Issamutty, the Channel is one opened by Captain Prinsep for a distance of 2 miles, the Banks which were originally 110 feet apart have been cut away to 197, precipitous and high for the first $\frac{3}{4}$ of a mile, the water always abundant, not being less than 12 feet at low time of tide. There is a Towing-path from Huseinabad on the South Bank, which requires clearing of jungle, though this portion of the line has a better appearance than others—the Zemindars having kept the path in order, and cleared away part of the jungle for about a mile—200 feet of the Bank on the South side has been cut away, and $\frac{1}{4}$ mile Westward another breach was visible, originally causing the spread of high tides over the land, to prevent which the Zemindars have constructed an Inland Bund, and been obliged to repair the old Towing Embankment erected by the late Captain Thomson about 6 years ago: between this Embankment and the Canal is much jungle requiring to be cleared, as it is a total obstruction to the Towing.

6. The Bayleygunge Canal is now a contracted Channel of 8,500 feet long, is dry at low tide: the bed has silted considerably from the circumstance of a meeting of the tides, and a bar created in the most dangerous part, being the narrowest and where tigers abound. It is barely possible for Boats to track along, for though a Tow-path is in parts visible, the jungle is a great hindrance: this is the more to be regretted, as if it should happen that Boats enter that Canal with the beginning of the flood, they are presently stopped by the same current rushing up through the Gobra Khal, the closing of which alone would, I imagine, remedy the evil, though the attempt might be precarious.

7. The Bowanipoor Canal is 13,000 feet in length, opened by Captain Prinsep, has an average width of about 100 feet, the bed of this Canal has also silted.

The Channel on both Banks has been much encroached on by jungle, and which springing up in the very bed, is itself encouragement to deposit, and must be a hindrance to the passage of Boats at even half tide. The South Bank has been much broken, and the Towing-path covered with briars and brushwood. Drains have been cut from the adjacent lands to the Canal on the South side, having no retaining sods or masonry, and the rush of water through them has been one cause of the destruction of that Bank. If the expediency of a Drain had been admitted by the Superintendent, and a mouth of masonry been constructed, the lands would have been better preserved, and also the Canal Banks.

A 200 maunds Boat of lime found sunken in the Channel, and ordered to be removed by the owner.

8. *The Chytul Canal*, a Channel dug 3,000 feet long on the South Bank, of which the Towing-path is rendered useless by the jungle, and from the circumstance just stated of Cross Channels altering the direction of the current twice in the distance of 8 miles, Boats not being able to avail themselves of the means of towing are detained from 3 to 5 hours at each spot. This Canal is very narrow: rise of tide about 7 feet.

9. Hence to the Chultabarea Canal, a distance of 13 miles, the passage is by a fine open Channel, of nearly 200 feet wide, with 20 feet water: the jungle is dense on both sides, directly on the Banks, though the

country beyond is being cleared. Small villages are rising, and two or three residences of the European Grantees have been built, being signs of the improvement of the country.

10. *The Chultabarea and Bhangor Canal*, a Channel dug, which at low water is impassable from the silting of the bed, the width has somewhat contracted too from its original width of 110 feet by the deposit and sliding of the Banks, after a course of 17,000 feet it joins.

11. *The Gooneemagee Canal*, after crossing a portion of the Bejadaree Khal, which was widened by Captain Prinsep, and incorporated with what now forms the Gooneemagee and Bhojdigee Canals, the best Channel on the line, runs through stiff soil for 17,000 feet, has 6 feet water at low-tide, is generally in good order, requiring merely petty repairs to the Banks. On this line is a Ferry and Fishery, yielding an annual revenue of 91 Rupees.

There are Fisheries at Bhangor and Chultabarea, yielding 250 Rupees together per annum.

At the Western termination of Gooneemagee Canal, is about 200 feet of old Channel, joining it to—

12. *The Bhamungatta Canal*, a Channel of 14,000 feet in length, but only 75 feet wide, the original dimension: there is a towing embankment for the whole length, except about 2,000 feet, which require to be completed, and the brushwood removed from the Bund and space between the Bund and water. There is sufficient depth of water at all times for the navigation.

13. Turned off at the Eastern mouth of the Baliaghata Canal, and proceeded down the Tarda Channel, towards the North-Eastern end of Tolly's Nullah, which is not more than 80 feet wide, to Guriah Hath, and in many places only $1\frac{1}{2}$ foot water at low tide, causing thereby detention to the large class of Boats.

14. The repairs to the Guriah Hath Bridge, authorized to be commenced on, in Military Board's letter No. 7921, of 11th April, are in progress, and the passage over the Bridge closed from 24th instant. The Estimate was submitted with my No. 347, of 22nd April 1843, to your address.

15. The Eastern Bank of the Nullah, North-East of the Bridge, for 500 or 600 yards is precipitous, and the rise of the bed may be partly attributed to the sliding or crumbling of the Bank, as the base, which is soft mud, gets undermined. I would point to the benefit likely to be derived from sloping the Bank to the rear, both above and below the Bridge, where intervals between houses exist, which can be done when the Dredging is in progress, and which, I imagine, to be in contemplation. At and near Bustumghata are particularly objectionable spots, and many large trees overhanging the undermined Bank, the removal of some I have directed, which had partly fallen, but so great is the number of these on the brink, which the next rains may overturn, that I solicit authority for their removal, and sale partly to cover expense.

16. It appears to have been the practice for the owners of Boats for the purpose of repairs to the same, (and for which purpose they have permission to remain in the Canal a reasonable time) to excavate the Bank into large basins as temporary Docks, throwing the earth from the same into the Canal. I need not point out the excessive injury to the Banks by this practice, and how unchecked the abuse of the license to remain has been; in 10 or 12 instances the excavations are about 30 feet diameter, and 5 feet deep.

I have issued the following orders, viz. that those Boats now under repair shall not be removed till their owners have filled up the basins they dug, and that if after completion of the repairs of the Boat, the repairs to the Banks do not immediately take place, demurrage will be charged at the usual rates. I am quite satisfied that the extent of the damage was not

reported to the Superintendent by the Jemadar,—both he and the Peons of the establishment appear to have been very indolent in not properly traversing the line of the Canal with a view to prevention of injury.

I have further refused all applications from others to repair Boats in the Canal till the present damage has been repaired.

17. Between Tollygunge and Kamapohkurea, whence a small Nullah takes a Southward course, a complete bar has been formed, which is 2 feet above the level of the rest of the Channel; here the flood from the small Nullah meets that in Tolly's Channel, and though a piled Bund was formed by Captain Thomson in the small Channel, with a view of gaining an increased velocity to carry off the deposit, yet the effect of that Bund has been to widen the Channel of the branch Nullah at the expence of the Main Channel, by washing away the banks of the former and depositing the earth in the bed of the latter, this has been in progress for some time, and each succeeding year will increase the bar. I recommend therefore the removal of piled Bund (which, though falling to pieces, is sufficient impediment to cause mischief,) and the correction of the slopes of the Banks, to prevent further deposit from them.

18. Of several stakes which have been driven in to preserve the North Bank of Tolly's Nullah below Kamapohkurea, about one-third have fallen towards the water, they were not stout enough. The soil being so very soft, the sloping of the Bank to the rear at an acute angle with the horizon, will, I think, tend more to prevent deposit and preserve the banks than the light stakes above-mentioned, and I therefore have the honor to solicit instruction on that subject.

At old Tollygunge again are several trees whose roots are undermined, and which should be removed to prevent the probability of their being washed into the Canal, these are principally on the North Bank, whilst similar injury has been done to the Banks to that before mentioned by excavations for repair of Boats.

19. The Tollygunge Suspension Bridge wing-walls each present an ugly fissure, commencing at the base where the back chains produced would meet a horizontal line, and continuing irregularly up to the parapets, the NE. and SW. walls are more severely cracked than the others, the openings below being an inch and a half wide.

It is difficult to assign the cause, if the retaining masonry is connected with the wing-walls. I should say the chains have dragged, if not, the settlement has been in the wing-walls, if the former is the case, the back chains should be inspected. I have the honor to solicit permission to open one of the walls for that purpose, and for which but a small quantity of masonry need be removed.

The parts of this Bridge have been badly arranged, having been one of those early constructed, the railing is in the same plane with the chains, and consequently has been necessarily incomplete at the centre of the Bridge where the chain dips below the level of the hand rail, this is a fault, because when properly designed, a railing gives much rigidity to the platform, which is a desideratum in such structures.

A longitudinal iron strap, passing under the beams and upheld by the drop bars, has been much bent in several places, and several of the roadway beams are not at right angles to the axis of the Bridge, leading me to suppose that they have been shifted by a violent agent which may have also caused the before-mentioned fissures. The bolts are nearly $\frac{1}{4}$ less than the bolt holes, allowing too much play.

20. The Kaleeghat Suspension Bridge is in good order, the approaches require constant looking after : being exceedingly steep.

The arched foot Bridge at the Alipore Jail, the Alipore, Kyderpore and Hasting's Bridges, are in good order, with the following exceptions. The abutment of the Alipore Bridge exhibit settlement, but no sympathy.

Crack in Alipoor Bridge abutments.

toms of importance, and the Kyderpore Bridge abutment on the North side has also settled, the vault of the guard room under the approach having cracked in consequence, and leaks.

22. The rush of the tide past the Iron yard is making great encroachment on a bay Bank of Iron yard cut away by just above Bridge, and endangering the overseer's house, as the current effects of another year or two may cause heavier expence, I would recommend the construction of a dam across the small bay for the protection of the Bank, and for the purpose of reflecting the current.

23. The Government Bauleah is in such a very delapidated state, that it has become quite unserviceable. It leaks very much, and the deck planks and Bauleah. roof are rotten. I would recommend her immediate sale, as repairs would cost more than the purchase of a new Paunsway, which could be fitted up in the yard to serve all purposes for which it may be intended.

24. Thus having completed my report on the Canals, I have the honor to recapitulate the items for special consideration, and points on which I request instruction, and as there never have been any Annual Estimates for repairs to the Bridges and Canals, the works necessary to the Chitpore, Barrackpore, Dum-Dum and other Bridges on the Circular and Baliaghata Canals, referred to in paragraphs 2, are in progress, and will be charged in the Current Expence Bills.

I have the honor to be,

Sir,

Your most obedient Servant,

H. GOODWYN,

Capt. Engineers, Officiating Superintendent of Canals.

Recapitulation or Abstract of Works referred to as required.

1st. The clearance of jungle, and repairs to the Towing-paths and Banks of the Eastern Channels which were opened at the expence of Government, and on which an annual outlay of 500 or 600 Rupees was formerly expended.

2nd. Sloping off the Banks of Tolly's Nullah in such places, as from their precipitous and crumbling nature they cause deposit with the removal of and sale of trees overhanging the Banks, and are likely to be swept in.

3rd. Sanction to my instructions reported relative to the digging of basins for repairs of Boats, and injury to Banks of the Canal.

4th. Removal of piled Bund in the Kumapohkuriah Khal, and stakes from opposite Bank forming proper slopes to Banks.

5th. Examination of the wing-walls of Tolly Gunje Suspension Bridge.

6th. Construction of a Dam to prevent damage to Overseer's House in Iron yard, and to protect the Banks of Canal from further encroachment of the current.

7th. The proposed sale of Government Bauleah and purchase of Paunsway.

(NOTE A.)

With reference to the remark on the standards of the Ooltadunga Bridge, I beg to offer the following remarks, to show the consequences likely to arise from unequal pressure, by the position of the chain as in that Bridge.

In the annexed figure, if P represent the power necessary to separate the particles in BEFG, the proportion of strain will be AG : AB ::

$$P : W \text{ or } \frac{AB \times P}{AG} = W.$$

So that if the point G be only 1-6th part out of the centre, then $\frac{6 \times P}{4} = 1\frac{1}{2} P = W$, or

the portion AGFD will be only exerting one-half its power of resistance when the portion GBEF breaks away, whereas, if the line GF bisected the rectangle, then W would be equal 2 P.

The effect of the unequal pressure will be to force the weakest side B into a curve, and it will have a tendency to such figure till AG and GB be equal, if rupture does not ensue before.

This is a point which has been so little considered in construction, that settlements are often pronounced to be what is in reality the effect of the variation of the load from the centre of magnitude.

An elastic body would, in a moment, point out the effect of inequality of compression, what must be the consequence, therefore, on a body which allow of compression without restoration of its figure?

The pressure by the heavy load of a Suspension Bridge, perpendicularly on a Pier, is quite sufficient to produce the effect alluded to in brickworks, unless sufficiently counteracted by an arch or tie, affording resistance to the irregularly compressive power.

H. GOODWYN, *Captain,*
Engineers.

(No. 756 omitted.)

No. 757.

No. 988.

FROM THE SECRETARY TO THE MILITARY BOARD.

TO THE SUPERINTENDING ENGINEER,

South-Eastern Provinces.

6th June, 1843

SIR,

In acknowledging the receipt of your letter No. 105, of the 11th May last, submitting a report from Captain Goodwyn, on the state of the Soonderbund Canals and Iron Suspension Bridges, I am directed by the Military Board to request you will desire Captain Goodwyn to submit an Estimate for putting the Tow-paths, &c. of all Moffusil Canals alluded to in the 5th, 6th, 7th, 8th, 9th, 10th, 11th and 12th paras. of that officer's present communication, into a good state of repair, as suggested by you, and in future an Estimate should be annually submitted for such repairs as may be deemed necessary by the Superintendent.

2. With reference to the 4th para. of your above communication, the Board authorize you to desire the Superintendent to provide in an annual Estimate for the petty repairs required to the Bridges and Toll Houses.

3. In regard to the Ooltadangah Bridge, the Board approve of your remarks, and request you will call on Captain Goodwyn to furnish the information required in the 6th para. of your present letter.

4. With reference to the 9th para. of your letter under reply, relative to the excavation or closing of the Gobra Khall, the Board wish Captain Goodwyn to state, what the expence would be to execute the above work.

5. The Board approve of the instruction issued in the 15th and 16th paras. of Captain Goodwyn's Report, in regard to the removal of the trees on the Banks of Tolly's Nullah and the cutting of Docks for repairing Boats.

6. An Estimate should be prepared for putting the Kamarapookerrah Bund into an efficient state of repair, and as this work is close to Calcutta, the Board wish it for the present to be visited monthly, and a report to be furnished of its utility or the reverse, as the case may appear to the executive officer and yourself.

7. The Board await Captain Goodwyn's report on the state of the wall of the Tolly Gunge Bridge, and approve of your recommendations suggested in the 14th, 15th, 16th and 17th paras. of your above letter.

I have, &c.,
(Signed) H. DEBUDE.

No. 758.

No. 124.

FROM CAPTAIN H. GOODWYN, *Engineers,*
Offg. Collector of Tolls,

TO MAJOR H. DEBUDE,
Secretary Military Board.

Calcutta : 6th July, 1843.

SIR,

There is a village about a mile up the Kamrapokria Khâl, near the Russa Station, or Tolly's Nullah, from which is a Road direct to Kyderpore, and advantage of which is taken by many Canoes or Dongahs to unload cargoes to be transported to Kyderpore from the above-mentioned village, and which bears the same name as the Khâl. These boats, as they do not proceed to the junction of the Khâl with Tolly's Nullah, avoid the toll which would otherwise be due.

2. I beg to offer for consideration the question of the propriety of establishing a subordinate Station of one Mohurir and one Chuprassy at this point, for the purpose of collecting the dues, which I am led to suppose, will not be less than 500 Rupees per Annum.

I have the honor to be,

Sir,

Your most obedient Servant,

H. GOODWYN, *Captain, Engineers,*
Offg. Collector of Tolls.

No. 759.

No. 1762.

FROM THE SECRETARY TO THE MILITARY BOARD.

TO THE OFFICIATING COLLECTOR OF TOLLS.

Calcutta Canals.

SIR,

15th July, 1843.

I am directed by the Military Board to acknowledge the receipt of your letter dated the 6th instant, and to state, that unless the unloading of Canoes at the village of Kamapokreea, is likely to affect the amount of Tolls received to a much greater extent than 500 Rupees a year, the Board would not wish on this account to establish a new Chokey at the point mentioned.

I have, &c.,
(Signed) H. DEBUDE.

No. 760.

No. 84.

FROM CAPTAIN H. GOODWYN, *Engineers,*
Offg. Collector of Tolls,

TO MAJOR H. DEBUDE,
Secretary Military Board.

SIR,

Calcutta : 14th June, 1843.

In submitting the account of Toll Collections for the past month, which I beg the Board will notice, are Rupees 699-2-0 in excess of the same month of last year. I have the honor to lay before the Board the following measures which, upon mature investigation, I find will be the only effectual ones for remedying the great loss to the Revenue arising from the destruction of half Tickets, upon which demurrage or tolls are due, often to a considerable amount. During the past year no less than 2,862 Tickets have been lost; involving, perhaps, a deficiency of Toll revenue of Rupees from 8 to 10,000 Rupees in the whole year.

2. I will first point out what I have ascertained to be the causes of embezzlement of the Tickets, that the Board may be aware of the utility of the proposed arrangement.

3. There are about one hundred Auruthdars or Agents on the Baliaghata, Circular and Entally Canals, to each of whom, on an average 150 Boats are monthly consigned. These are the principal persons through whom the loss of the Tickets arise, as many of the Boats being of large Tonnage and heavily laden, they allow the merchandize to remain in the Boats, and thereby accumulate a large sum for demurrage. The following are some of the means adopted by these people for passing their Boats out of the Canal.

4. First, With Tickets of other Boats of equal measurement that may not have incurred demurrage. Secondly, By purchasing old Tickets (from the Mohurir, Chaprassy, or persons who collect Tickets at the Toll Chowkey) of Boats of equal Tonnage, for half or less than half of the Toll originally paid by the former holder of the Ticket. Their own Ticket is then destroyed.

5. A Boat coming into the Canal may obtain a correct Ticket perhaps to the value of 10 Rupees, but the check forwarded to the office, in many instances, may show but 10 annas; the Ticket on its return to the person from whom he got it, is destroyed to prevent detection.

6. Boats often are broken up for firewood, on which, from the time they have been in the Canal, a large amount of Demurrage is due, but many of these have no Tickets, and the Jemadar, on receipt of a present, will then only forward to the office the number of Tickets he gets, though that may be only equal to one-half the number of Boats.

7. The Agents are, however, the great causes of the roguery, and the loss of Revenue, and the instigators of the deceit practised, and should therefore be made the responsible persons, and answerable for the loss of Tickets. The amount due on which, I propose to ascertain by the following means, which, though simple, will, I think, be effectual, and I hope meet with the approval of the Board.

8. Each Agent has his own Khalgushtie, or person who pays toll and receives Ticket for his employer's Boats. These men at present are unknown to the Toll Darogah as the authorized Agents, their very names are unknown, and consequently they escape responsibility.

I propose that they should show a Certificate from the Auruthdar who employs them. So worded as to hold the Auruthdar alone responsible for the acts of the subordinate: the originals of these to be kept in this office, and copies furnished to the Darogahs.

9. The Tickets, as now framed, bear only the name of the Mangee, who, even if the wilful loss of his Ticket is discovered, is not able to bear the loss nor pay the amount due. The Tickets henceforth to have the name of the Auruthdar on them, as certified by the Khalgushtie, and written by the Darogah, who, when the Tickets are returned, will give the Auruthdar a receipt for the same.

10. In the event of loss of Ticket the Agent's name is thus known, and if he cannot produce the Darogah's receipt, he becomes immediately responsible and punishable, and so likewise on the other hand, does the Darogah, if the Auruthdar produces the receipt and the half Ticket be not forthcoming.

11. That the present two Jemadars and some of the Peons on the establishment have connived at the loss of the Tickets I am quite sure. I think it would be advisable to commence the new system with men for whom the Darogahs themselves will be responsible and give security, and who have no connexion with the Auruthdars, for as these men are checks on the proper collection of the Tolls, their characters should be as good as the nature of things will admit of.

12. I beg to annex a facsimile of the new Ticket, and to solicit the sanction to the measures proposed, and though consistently with the present heavy duty in the Iron yard, I will exert all means to advance the interests of the Government. I beg to assure the Board, that instead of the Iron Bridge yard being a secondary item of my appointment, it occupies three-fourths of my time unceasingly, and to my Toll and Canal works I devote all that is to spare, and they too require watchful superintendence.

I have the honor to be,

Sir,

Your obedient Servant,

H. GOODWYN *Captain Engineers,*

Offg. Collector of Tolls

No. 760. a.

Facsimile of proposed new Ticket

ধাপা চৌকি ...	...	...	...	...	Dhapa Chowkee.
নম্বর ...	...	...	...	...	Number
কুত ...	...	...	...	...	Maundage
আড়তদার ...	...	...	...	...	Auruthdar.
মাজি ...	...	...	...	...	Mangee.
প্রবর্ত ...	...	...	...	...	Entered
গিয়াছে ——— দিন ...	...	...	...	...	Went out ——— days

H. GOODWYN, *Captain,*
Offg. Collector

No. 761.

No. 1782.

FROM THE SECRETARY TO THE MILITARY BOARD.

To CAPTAIN H. GOODWYN,

Offg. Collector of Tolls.

SIR,

15th July, 1843.

I am directed by the Military Board to acknowledge the receipt of your letter No. 84, of the 14th ultimo, and in reply to request, that a trial be given to the system proposed by you for putting a stop to the embezzlement of Toll Tickets.

I have, &c.,

(Signed) H. D.

(No. 762 to No. 767 inclusive, omitted.)

No. 768.

No. 1247.

FROM THE SUPERINTENDING ENGINEER,

South-Eastern Provinces,

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 11th August, 1843.

Adverting to the 1st and 4th paras. of your letter No. 988, dated the 6th June last, I have the honor to submit the enclosed Estimates received 22nd ultimo, with Captain Goodwyn's letter No. 184, of that date, accompanied by a sketch.

Estimate No. 6, by Captain Goodwyn, Officiating Superintendent of Canals, of the probable expence of cutting Jungle, repairing and remaking Tow-paths, damming Cuts and completing the tracking communication along the Eastern Canals, amounting to Company's Rupees 4,365-11-10.

Estimate No. 7, by the same officer, of the probable expence of damming up the Gobrah Khall, amounting to Company's Rupees 5,347-6-0.

2. The work detailed in the first of the above Estimates is, I think, necessary for the improvement of the navigation of the Sunderbund Canals, and I therefore beg to recommend the estimate for sanction. The rates, considering the part of country where the work is to be done, are not unreasonable, and on this account I make no objection to 10 per cent. being charged for contingencies.

3. With respect to the second Estimate for closing the Gobra Khall, although if successful, a beneficial work, yet I am so doubtful of its being successfully accomplished for the amount mentioned, that I would wish the estimate to be held over* till a more favorable season will admit of both Captain Goodwyn and myself becoming better acquainted with the difficulties attendant upon this work; any delay that may occur in its execution if ultimately approved of, if it tend to the probability of a more successful result, as it doubtless will, will be more satisfactory in the end than commencing the operation with inadequate information, and perhaps inadequate means.

I have the honor to be.

Sir,

Your obedient Servant,

W. R. FITZGERALD, Major,

Supg. Engineer, South-Eastern Provinces.

* See Appendix
J. No. XXXVII.
No. XXXVIII.—
J. M.

No. 768. a.

CANAL DEPARTMENT

Estimate No. 6.

Estimate framed by CAPTAIN GOODWYN, Engineers, Officiating Superintendent of Canals, of the probable expence of cutting Jungle, repairing and re-making Tow-paths, and by damming Cuts, completing the tracking communication along the Eastern Canals, with reference to orders of Military Board, contained in Superintending Engineer's No. 533, of 12th June, 1843.

Calcutta . 30th June, 1843

SPECIFICATION

Husinabad Canal. From its junction with the Eshamutty River to its junction with the Dossah Khall is 9,660 feet in length. The height of its Banks vary from 3 to 14 feet, and the Tow-path is on the South Banks.

5,280 running feet is to be repaired ; 5,060 running feet \times 30 feet of Jungle is to be cut, it abounds with large trees ; 3,610 feet in eight different places are entirely cut away by the water of the adjoining lands running over the Banks into the Canal, the Zemindars have made a small Bund about 2 feet 6 inches high, by 4 feet at bottom, and 1 foot at top along these parts, about 100 feet in rear of the original Bank : should these be repaired, 1,100 feet will have to be piled to secure the Bund or Tow-path after it is made ; the breadth of three Nullahs will have to be closed with a substantial Bund and Tow-path made over them, these Nullahs measure only from 40 to 50 feet in width, and from 5 to 7 feet in depth, they were cut by the Zemindars to drain their lands, and after the purpose for which they were cut was accomplished, the Zemindars formed a Bund about 150 feet in rear of the original point.

640 running feet of the Bank close to its junction with the Eshamutty being extremely high, has been greatly cut away by the current, it should be piled with Soondry stakes to secure the remaining part of the Road.

Bayley Gunge Canal. From its junction with the Dossah Khall to its junction with the Gobra Khall is 7,500 running feet in length—jungle 30 feet in width to be cut ; the whole length 700 feet of Tow-path must be re-made, as very little of the original one can be seen.

Bhowaneepore Canal. From its junction with the Gobra Khall to its meeting with the Taintoo Khall is 11,440 running feet in length—7,400' \times 30' of jungle to be cut, 9,490 feet of Tow-path is to be partially repaired, 620 feet the breadth of two Nullahs will have to be piled with Soondry stakes, and a Bund made so as to allow a free passage for tracking, they have been occasioned by the water of the adjoining lands running into the Canal over the Bank, one Nullah measures 220 feet, the other 410 feet, the length of 5 slips will have to be piled to secure the remaining part of the Tow-path ; 130 feet in two places has been cut by the Zemindar and Tunnel Drains made for the purpose of draining their lands ; about 40 feet back from the water the tracking can be carried on over them, but 740 feet of Tow-path will have to be made, as the Bank here is on a level with high-water, and in some places below it. Two Docks have been cut by the Zemindar (one measuring 20' \times 15' the other 30' \times 20') to keep his Boats in, they should be closed without fail, as it has been done without orders.

Taintoo Khal. The length of it is 5,000 feet jungle, 30 feet in width to be cut, and a Tow-path made the whole length, as nothing of the former Tow-path can be seen.

A Nullah 50 feet wide is to be closed.

Choytol Basrah. Its length is 300 feet jungle, 30 feet in width to be cut, and Tow-path partially repaired the whole length ; a Nullah 20 feet wide will have to be closed.

Bhangur Canal. Its length is about 12,000 feet, 140 feet of Tow-path will have to be made as this length of the Bank is under water ; eight Nullahs cut by the Zemindars for draining their lands will have to be closed, they measure as follows :—two of 5 feet each, two of 15 feet each, two of 20 feet each, and two of 10 feet each.

Bhojdigee Canal. Its length is 6,700 feet jungle, 5,500 feet \times 30 feet to be cut on the South Bank ; 500' \times 30' of ditto to be cut on the North Bank, this space is 2 feet under water, 4,400 feet of Tow-path is to be made, as nothing of the former one can be seen ; the Banks 80 to 100 feet from the water are high and good, but the Tow-path cannot be removed to such a distance, for it will obstruct tracking greatly. The Tow-path along this Canal to the distance of 1,200 feet is on the North Bank, the rest on the South Bank.

Ghonee Magee Canal. Its length is about 12,000 feet, the Tow-path is in good order, two Nullahs occasioned by the falling of water over the Bank into the Canal will have to be closed, one measures 30 feet wide, the other 20 feet.

Bentah, portion of above Canal. Its length is 5,000 feet, the Tow-path is in good order, 3,000' \times 15' of small jungle is to be cut.

Kataltollah, another portion of above Canal. Its length 7,800 feet, of which 1,000 feet has never had any Tow-path, the rest of the Tow-path is in good order ; 5,000' \times 20' of small Jungle is to be cut 80 feet wide, one Nullah will have to be closed, and one slip, 200 feet in length, will have to be piled to secure the remaining part of the Tow-path.

Bhamunghattah Khall. Its length is 2,200 feet jungle, 50 feet wide to be cut to enable the earth to be got for the Tow-path, and a Tow-path is to be made the whole length, as nothing of the former one can be seen.

General Section of renewed Tow-path to be

MEASUREMENTS.	Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle
<i>Husunabad Canal</i>			
Renewed Tow-path $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 3,600$.	75,600,		
Tow-path over Nullahs, 21 \times 130 .	2,730,		
Total cubic contents Tow-path,	78,330		
Cuts to be closed total length 130 feet.			

Section.

$\frac{20 + 10\frac{1}{2}}{2} \times 6 \times 130 =$ ..	..	..	11,895	
Jungle to be cut, 5,060 \times 30 = ..	..	..	..	151,800
<i>Bayley Gunge Canal.</i>				
Tow-path to be renewed, Section as above.				
$\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 700 =$	14,700	..	..
Jungle to be cut, 7,000 \times 30 = ..	..	..	..	225,000
Carried over, Co's. Rs.	93,030	11,895	376,800	

CCC1

<i>Bhowanipoor Canal.</i>				Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle.
Brought forward, ..				93,030	11,895	376,800
Cuts to be closed, total length 620 feet.						
Section.						
	$\frac{16\frac{1}{2} + 8}{2}$	$\times 6 \times 620 =$	..		45,570	
Jungle to be cut, ..	7,400	$\times 30 =$	..			222,000
Temporary Docks filling.						
	L.	B.	D.			
One	30"	$\times 20"$	$\times 4 = 2,400$			
One	20	$\times 15$	$\times 4 = 1,200$			
Total cubic feet, ..					3,600	
Area. Length.						
New Tow-path	$\frac{10\frac{1}{2} + 1\frac{1}{2}}{2}$	$\times 3\frac{1}{2} = 21$	$\times 740 =$	15,540		
<i>Taintoo Khal.</i>						
Jungle to be cut, ..	5,000	$\times 30 =$	..			150,000
New Tow-path	$\frac{10\frac{1}{2} \times 1\frac{1}{2}}{2}$	$\times 3\frac{1}{2} = 21$	$\times 5,000 =$	105,000		
Ditto over Nullah, ..	21	$\times 50 =$	1,050			
Total, ..				106,050		
Cut to be closed Section.						
	$\frac{20 + 10\frac{1}{2}}{2}$	$\times 7 \times 50 =$	..		53,375	
<i>Choytol Basra Canal.</i>						
Jungle to be cut, ..	3,000	$\times 30 =$	..			90,000
<i>Bhangur Canal.</i>						
Cut to be closed, Section same as above.						
	$\frac{20 + 10\frac{1}{2}}{2}$	$\times 7 \times 100 =$	..		10,675	
New Tow-path over Bund	$\frac{10\frac{1}{2} + 1\frac{1}{2}}{2}$	$\times 3\frac{1}{2} = 21$	$\times 100 = 2,100$			
New Tow-path on Bank, ..	21	$\times 140 =$	2,940			
Total, ..				5,040		
<i>Bhojdigee Canal.</i>						
Jungle to be cut, ..	6,000	$\times 30$	..			1,80,000
Tow-path of Section.						
	$\frac{12\frac{1}{2} + 1\frac{1}{2}}{2}$	$\times 5 = 35$	$\times 4,400 =$	154,000		
Carried over, Co's. Rs...				373,660	125,115	10,18,800

<i>Goneemagee Canal.</i>				Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle.
Brought forward, ..				373,660	12,5115	10,18,800
Cuts to be closed, Section as above.						
$\frac{20 + 10\frac{1}{2}}{2} \times 7 \times 50 =$ ..				..	5,3375	
<i>Beanlah Canal.</i>						
Jungle to be cut, .. 3,000 \times 15 = ..				..	..	45,000
<i>Kataltollah Canal.</i>						
Jungle to be cut, .. 5,000 \times 20 = ..				..	..	1,00,000
Cut to be closed, Section as above.						
$\frac{20 + 10\frac{1}{2}}{2} \times 7 \times 80 =$ ..				..	8,540	
<i>Bammunghata Canal.</i>						
Jungle cutting, .. 2,200 \times 50 = ..				..	..	110,000
Arca.						
New Tow-path $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 2,200 =$..				46,200	..	..
Total Measurement, ..				4,19,860	90,955	12,73,800

Abstract.

4,19,860	Cubic feet new Tow-path or 575 Chowkas, at 2-4 per chowka,	1,293	12	0
90,955	Ditto damming Cuts or 124 Chowkas, at 2-4 per Chowka, ..	279	12	0
12,73,800	Supl. feet of cutting Jungles, at 0-2 per 100 feet, ..	1,592	4	0
18,870	Cubic feet of Tow-path to be repaired, at 0-10 per 100 feet, ..	117	15	0
1,050	Running feet of piling to Banks, at 26 per 100 feet, ..	273	0	0
	Establishment and Boat hire for overseer, ..	100	0	0
Total Co's. Rupees ..		..	..	3,655 15 0
Add contingencies at 10 per cent., ..		..	..	365 9 6
Grand Total, Co's. Rupees ..		..	..	4,021 8 6

H. GOODWYN, *Captain,*
Offg. Superintendent of Canals.

Memo.—Salt Water Lake Tow-path.

The whole length of the Tow-path made on the SW. Bank of the Salt Water Lake in the year 1833, is 7,100 feet, the Tow-path then made was 3' 6" high, 1' 6" at top and 10' 6" at bottom; but at present there is a Bund along this line which has been made by the Zemindars and Fishermen 3' 6" high, 1 foot at top and 3 feet at bottom, consequently this Bund will have to

cccliii

be increased to the original size of the Tow-path, as shown above: the shaded part is the present Bund, and the outer line the part to be added.

$\frac{7.6 + 6}{2} \times 3' 6" \times 7,100 = 99,400$ cub. feet or 136½ Chowkas, at 2-4
per Chowka, 306 12 0
A wooden Bridge to be made across a Nullah to connect Tow-paths as
was originally done. The old Bridge being destroyed for want of repairs
probable cost, 40 0 0

Total Co's. Rs. .. . 346 12 0
Above amount, .. . 4,021 8 6

Grand total, Co's. Rs. . . . 4,366 4 6

H. GOODWYN, *Captain,*
Offg. Superintendent of Canals.

No. 769.

No. 3193.

FROM THE MILITARY BOARD,

TO THE DEPUTY GOVERNOR OF BENGAL, &c.

9th September, 1843.

HONORABLE SIR,

We have the honor to submit the undermentioned estimate by Capt. Goodwyn, of the probable expence of cutting jungle, repairing and re-making Tow-paths, &c. of all the Moffussil or Sunderbund Canals, and to recommend that it be sanctioned. The estimate has been prepared under our orders, and the rates assumed in it are admissible.

We have, &c.,

J. H. P.
J. C.
R. B.
S. M. T.

No. 770.

No. 3194.

TO THE SUPERINTENDING ENGINEER,

South-Eastern Provinces.

9th September, 1840.

SIR,

In acknowledging the receipt of your letter No. 1247, of the 11th August last, I am directed by the Military Board to mention, that as they doubt the practicability of bunding up the Gobra Khall, with reference to former correspondence on the subject, they have desired me to transmit to you the accompanying original papers as per margin, with

Pro. 14th April,
1837, E.
Ditto 16th June,
1837, P.

a view to enable yourself and Captain Goodwyn to investigate the expediency of attempting to dam the Khall in question.

2. The Estimate for making improvements to the Sunderbund Canals, has been this day recommended to Government.

I have the honor to be,

Sir,

Your obedient Servant,

FORT WILLIAM, MILITARY BOARD OFFICE:

(Signed) H. DEBUDE,

9th September, 1843.

Secretary Military Board.

(No. 771 omitted.)

No. 772.

No. 302.

FROM CAPTAIN GOODWYN,

Collector of Tolls.

TO CAPTAIN G. T. GREENE,

Secretary Military Board.

Fort William : 4th December, 1843.

SIR,

In submitting the statement of Collections for the half-year ending 31st October last, on the Calcutta Canals, I have the honor to offer the following remarks relative to statement D.

Panspota Chowkee, Tolly's Nullah.

The decrease in the Collection from July to October is principally owing to the difficulty of getting large Boats through the Channel at low-water from the silting of the bed, and when forced over the sand, it was at much expence which obliged the Mohajuns to unload the large Boats, and transport the goods in dingees, and ultimately they removed their Agencies to the Balliaghatta Canal during those months.

Kidderpore Chowkee, Tolly's Nullah.

Coals being now largely used for brick-burning where wood in large quantities used to be used, has been one reason for the decrease of Tolls at this Chowkee, as also the low state of the markets for all sorts of country produce this season.

Balliaghatta Canal, Dhapa Chowkee.

The Collections for May and June were much increased, but afterwards a decrease in the number of Boats occurred owing to the very low price of wood, and from rice having been almost unsaleable, much caused from immense quantities being brought from the Eastward to the Kumrapokrea Khál on Tolly's Nullah, above and beyond the controul of the Toll Chowkee. It is there crossed and brought in carts by hundreds to the Town, the Toll Duty being thus avoided.

Many rum-distilling establishments have no existence this year, so that but little molasses has come into the market, which last year came in large quantities.

With regard to missing Tickets I may observe, that the 317 unrecovered up to the 31st October, were of those issued previous to the issue of the new Tickets, in which the Auruthdar's names were inserted, which came into force during August subsequently, and that scarcely one has been lost since. This circumstance was brought to the notice of the Board in my letter No. 84, of the 14th June last, and is proof of the efficiency of the system, whilst it is satisfactory to me to be able to state, that the decrease in the collections has not been owing to other cause than the difference of traffic, whilst every exertion has been used to promote the Revenue interests, under circumstances extremely difficult.

I have the honor to be,

Sir,

Your obedient Servant,

H. GOODWYN, *Captain.*

Collector of Tolls.

FINIS

APPENDIX TO APPENDIX (H.)

Supplemental Papers.

No. I.

No. 1685.

TO THE RIGHT HONORABLE LORD WILLIAM CAVENDISH BENTINCK, G. C. B.,
Governor General in Council, &c. &c. &c.

Fort William.

Miscellaneous Department.

MY LORD,

With reference to the orders of Government, dated 29th November 1827, addressed to the late Presidency Board, directing that the Acting Commissioner in the Soonderbuns should depute proper persons to measure and value the ground at Baumunghatta required for the Eastern Canal, we have the honor to forward three Statements of the estimated value of lands and trees, including compensation for the removal of huts, and as we see no reason to object to that valuation, we request authority for the Commissioner to disburse the amount.

Statement No. 1 exhibits the value of lands, &c., in Pergunnah Augur- para and Myhatti,	Total, .. Sa. Rs. }	948 12 0
Statement No. 2, ditto ditto in Pergunnah Calcutta, " " "		7,805 0 0
Statement No. 3, ditto ditto in Pergunnah Pykehatti and Balindah, }	Total, .. Sa. Rs. }	2,017 14 8

1. Pergunnah.	2. Malgozarree Lands.		3. Lakheraj Lands.		4. Total, Value.
	Quantity.	Value.	Quantity.	Value.	
No. 1. { Augurpara, Statement, { Myhatti,	13 6 0 8 14 0 30 0 0	380 0 0 87 8 0 447 8 0	19 12 0 19 12 0	501 4 0 501 4 0	948 12 0
No. 2. { Calcutta, Statement, {	385 12 8	6,771 0 0	42 3 8	1,034 0 0	7,805 0 0
No. 3. { Jointly Pergunnah Pykehatti, & Statement, { Balindah,	156 12 0	1,814 10 8	11 17 0	203 4 0	2,017 14 8
Grand Total Sa. Rs. ..					10,771 10 8

Grand total, Sa. Rs. 10,771 10 8

2nd. An Abstract is inserted in the margin, showing the quantity of Land, Lakheraj and Malgoozarry, and value thereof in each Pergunnah.

3rd. From the subjoined copy of a letter from the Commissioner in the Soonderbuns, dated the 31st of January, it would appear, that the proprietors will be content to receive the proposed indemnification.

We have the honor to be, with respect,

My Lord,

Your Lordship's most obedient
and very humble Servants,

J. PATTLE.

W. BLUNT.

SUDDER BOARD OF REVENUE,

FORT WILLIAM:

The 14th April, 1829.

[ii]

No. I. a.

G. A. BUSHBY, ESQ.,

Secretary to the Board of Revenue, Lower Provinces.

SIR,

I have the honor herewith to forward the Statement No. 1, returned with your letter of the 9th instant, No. 126, duly corrected.

The Lands were valued according to the actual produce of the soil, and the rents received therefrom by an Officer of my establishment, specially deputed for that purpose, and I can only account for the Lakheraj Lands bearing so low a price in comparison with others, and the difference in value of various portions from the circumstances of their unproductiveness, many parts of the country through which the Canal passes being *putteet* and waste.

I have had numerous applications from the proprietors to receive the amount of their Lands taken for the Government purposes, but not one complaint has been made relative to the lowness of the rates fixed on them.

I have, &c ,
(Signed) WM. DAMPIER,
Commissioner.

SOONDERBUN'S OFFICE :
31st January, 1829.
CAMP COBADDUK RIVER.

SUDDER BOARD OF REVENUE.
(True Copy.)

G. A BUSHBY,
Junior Secretary.

No. II.

No. 572.

TO SUDDER BOARD OF REVENUE.

Miscellaneous—Revenue.

GENTLEMEN,

The 5th May, 1829.

I am directed by the Right Honorable the Governor General in Council to acknowledge the receipt of your Letter, dated the 14th ultimo, with its enclosures, and in reply to communicate as follows,—

From the statements submitted by Mr. Dampier it would appear, that the only individuals to whom he proposes to assign a compensation for the land taken for the Eastern Canal, are the Zemindars of the Malgoolzarree land, and the proprietors of Lakheraj land; of the latter it is presumed, that the owners are also the actual occupants, and in respect to them the payment proposed by the Commissioner seems unobjectionable; but in regard to the Malgoolzarree lands, it is presumed, that they must have been in the occupation of ryotts, for whose interests, whether as regards their right of occupancy, the deduction in their rents to which they may be entitled, or the compensation for the removal of their houses and trees, no arrangements, as far as can be gathered from the statements, appear to have been made by the Commissioner.

Before authorizing the payment of the proposed compensation, the Governor General in Council desires that Mr. Dampier shall be directed to make a further enquiry into the above points, and in elucidation of the mode in which Government would wish his proceedings to be conducted, I am directed to refer your Board to a Report and Statement of Lands taken for the new Nagpore Road, the compensation for which was adjusted by the Collectors of Hooghly and Midnapore, and submitted to Government in Letters from the Acting Secretary to the late Board of Revenue, under dates the 25th July and 26th August 1823. On referring to those proceedings your Board will observe, that the interests of all parties, from the Zemindar to

the Ryott, were carefully provided for by the Collectors of the above districts: Mr. Dampier's attention may likewise be directed to the spirit of the Rule in Cl. 3, Sec. 6, Reg. I., 1824.

The necessary arrangements being made to secure the rights and interests of the inferior classes, His Lordship in Council is of opinion, that instead of purchasing the Mal-goozarree Land outright, the most expedient mode of compensating the Zemindars will be to allow to each a deduction from the Sudder Jumma payable by him to Government, equal to the amount of the net rent which he would have received for the land from his Ryotts.

For houses, trees, or other property of a similar kind, whether the same belong to Ryotts or Zemindars, a distinct compensation must of course be made—it will however be convenient to have a separate Statement furnished for those items

The original Documents which accompanied your Letter are herewith returned.

I have, &c.,
(Sd.) _____
[Secretary to Government.]

No. III.

TO SECRETARY TO THE GOVERNOR GENERAL,

Revenue Department.

Miscellaneous—Revenue.

SIR,

15th May, 1832.

I am directed by the Honorable the Vice-President in Council, to transmit for His Lordship's perusal, the accompanying Letter from the Military Board, No. 97, dated the 1st instant, submitting observations by Captain F. Jenkins,* on the new Canals in the Soonderbuns and on the Entally Canal.

* See Appendix
to Appendix (H)
No. 88, page liii.

I have, &c.,
(Sd.) J. T.
[Deputy Secretary to Government.]

No. IV.

No. 2929.

TO JAMES THOMASON, ESQ.,

Deputy Secretary to Government, Revenue Department.

Revenue Department.

SIR,

I am directed by the Right Honorable the Governor General to return to you the Original Letter from the Military Board, submitted with your's of the 15th ultimo: the observations of Captain Jenkins, relative to the state of the new Soonderbun and Entally Canals, will remain for future consideration. In the meantime, the remarks contained in the 10th Para. of that Officer's report, seem to His Lordship to merit attention, if indeed the grants of waste Lands in the Soonderbuns do not already stipulate and secure the right of tracking and travelling-ground on the River face of the several grants.

I have the honor to be,

Sir,

Your most obedient Servant,

W. H. MACNAGHTEN,

Secretary to the Governor General.

SIMLA:

The 26th June, 1832.

No. V.

To ACTING SECRETARY SUDDER BOARD,

Presidency.

Miscellaneous—Revenue.

SIR,

July 10th, 1832.

I am directed by the Honorable the Vice-President in Council, to call the Board's attention to the accompanying Extract (Para. 10) from a Letter addressed by Captain F. Jenkins to the Military Board, on the 16th April last, submitting observations on the new Canals in the Soonderbuns, &c., and to request, that the Commissioner may be called upon to state whether any and what stipulations have been made with the grantees of waste lands in the Soonderbuns, to secure the right of tracking and travelling-ground on the River face of the several grants.

I am, &c.,

(Sd) J. T.

[*Deputy Secretary to Government.*]

No. VI.

No. 110.

To THE SECRETARY TO GOVERNMENT,

Revenue Department.

Miscellaneous Department.

SIR,

With reference to Mr. Deputy Secretary Thomason's Letter of the 10th July 1832, calling upon the Sudder Board of Revenue to ascertain and report whether any, and if any, what stipulations have been made with the grantees in the Soonderbuns, to secure to the public the right of tracking and travelling upon ground to be left for those purposes on the River face of the several grants, I am directed to submit for the information of His Lordship in Council, the accompanying Letter from the Commissioner of the Soonderbuns, dated the 22nd ultimo, from which it will be perceived, that no such stipulations have ever been made with the grantees. His Lordship will further observe, that, owing to the peculiar mode of navigating the streams in that tract of country, which is almost exclusively effected by tiding, it is Mr. Dampier's opinion that no such stipulations would be of any public benefit, as far at least as mere water-carriage is concerned.

SUDDER BOARD OF REVENUE,

FORT WILLIAM :

The 3rd May, 1833.

I have the honor to be,

Sir,

Your most obedient Servant,

ROSS D. MANGLES,

Acting Secretary.

[v]

No. VI. a.

To R. D. MANGLES, ESQ..

*Officiating Secretary to the Sudder Board of Revenue,
Fort William.*

SIR,

In reply to your Letter of the 16th instant, No. 4, I have the honor to state for the information of the Sudder Board, that no stipulations have ever been made with the Soonderbun Grantees for the right of travelling and tracking ground on the River face of the several grants, nor am I inclined to think such a stipulation would be of any use to the travellers or merchants proceeding through the Soonderbun passages. The whole of the route is through rapid tideways, and the Boats, by quitting at particular times the anchoring places, manage easily to reach the several points where the tide changes, so as to take advantage of each tide, until they pass through the jungle. In the cultivated parts of the passage to the eastward, during the several years that I have been moving about and through it, I have seldom seen laden Boats tracking in the tideway, as they find it better to wait for the flow or ebb as they require to move, than to exhaust their crews in tracking against the stream. In the next place, throughout all the Soonderbun grants which are situated on the eastern route, the Grantees are obliged to raise large bunds to keep out the high spring-tides. These bunds cannot be erected immediately on the banks of the River, as they would be liable to injury from the constant action of the water on them, and it is found that by leaving a portion of land between the bund and the River uncultivated, and with small jungle growing on it, the ground is preserved from the encroachments of the River. If these places are cleared for Roads and tracking-paths, the security which the smaller jungle gives will be lost, and the land exposed to constant encroachment from the River, whilst the navigation of the passage will not be bettered by the measure. The great danger in the Soonderbun passages is from the stems of trees which project from the banks of the jungle-lands, and against which Boats are frequently forced by a sudden gust of wind or an eddy of the tide: as the clearings go on, this will of course entirely cease to exist, and I think it would only discourage the Grantees on the main passages who have been cultivating for several years to demand any new stipulation from them for any purposes whatever.

I have, &c.,

(Signed) W. DAMPIER,
Commissioner.

SOONDERBUN COMMISSIONER'S OFFICE,

BAUGUNDY :

The 22nd April, 1833.

No. XIX.

Act No. XXII of 1836, passed by the Right Honorable the Governor General of India in Council, on the 26th September 1836.

I. It is hereby enacted, that from the first day of November 1836, Regulation VII of 1810 of the Bengal Code, and also such parts of Regulation XVIII of 1806 of the Bengal Code, as relate to the Eastern Canal, commonly called "Tolly's Nullah," which connects the River Hooghly with the Sunderbunds, shall be repealed.

II. And it is hereby enacted, that from the said first day of November 1836, the Governor of Bengal shall be competent to prescribe the amount of Toll, and the mode of levying the same, on boats, rafts and floats, which shall enter on, or pass out of, or through, either of the two lines of navigation hereinafter described—that is to say,

1st. The Eastern Canal aforesaid, from its entry into the Sunderbunds to its junction with the River Hooghly.

2nd. The line made up of the Channel across the Salt-water Lake to Baminghatta, of the Canal leading from the Salt-water Lake to the Boitakhanna Road, and of the new Circular Canal which connects the last mentioned Canal with the River Hooghly.

III. Provided always, that the aggregate amount of Toll levied on account of the whole passage along either of the two lines aforesaid, or on account of entering into, or passing out of, either of the two lines aforesaid, shall in no case exceed one Rupee and a half for every hundred Maunds burden on any boat, or two Annas for every timber, on every raft of timber, or four Annas for every hundred bamboos, on every float of bamboos.

IV. And it is hereby enacted, that the said Governor shall be competent to fix a rate of Rent to be levied on every boat which shall remain in any part of either of the lines aforesaid longer than two days for every hundred Maunds of burden, and on every raft of timber which shall so remain longer than one day for every ten timbers, and on every float of bamboos which shall so remain longer than one day, for every two hundred bamboos.

V. And it is hereby enacted, that the said Governor shall be competent to appoint Officers for the collection of the Tolls and Rent hereinbefore mentioned, and to confer on such Officers, for the purpose of preventing acts whereby either of the said lines of navigation may be obstructed, or whereby the banks along either of the said lines of navigation may be damaged, any or all the powers possessed by Magistrates in respect to navigable Streams and Rivers.

VI. And it is hereby enacted, that whoever wilfully causes any obstruction of either of the said lines of navigation, or any damage to the banks along either of the said lines of navigation, shall be punishable, on conviction before the Magistrate, with imprisonment for a term not exceeding fourteen days, or fine to an amount not exceeding 50 Rupees, or both; and in default of payment of such fine, with additional imprisonment for fourteen days.

VII. And it is hereby enacted, that Notifications of the rates of Toll and Rent, and of the places of collection, and of all Rules made by the said Governor under the authority given to him by this Act, shall be published in the Calcutta Gazette, and exposed to public view at every Toll-house, on either of the said lines in the English, Persian, and Bengallee tongues.

VIII. And it is hereby enacted, that if the Toll or Rent due in respect of any boat, raft or float, on either of the said lines, shall not be paid on demand to an Officer authorized by the said Governor to receive the same, it shall be lawful for such Officer to seize such boat, raft or float, and the cargo thereof, and to detain the same, and if the said Toll or Rent shall have been paid upon any day before the tenth day after such seizure, then the said boat, raft or float, shall be released, or if not paid within the said ten days, it shall be lawful for such Officer with the sanction, and under the directions of the Superintendent of Canals, to sell the property seized, or so much thereof; as the said Superintendent shall direct, for the purpose of satisfying the Toll or Rent which may be due, and also of defraying the expences of seizure and detention; and in every such case, so much of the property seized which has not been sold, and so much of the price of the property sold, as is in excess of the sum necessary for satisfying the Toll or Rent which is due, and for defraying the expences of seizure and detention, shall be returned to the Owner of the boat, raft or float.

IX. And it is hereby enacted, that if any person in charge of any boat, raft or float, shall attempt to evade payment of the Toll or Rent due thereon, or shall resist a seizure made by the authority and under the circumstances hereinbefore described, such boat, raft or float and the cargo thereof, shall be forfeited to the Government under orders of the Superintendent, subject to appeal to the Commissioner of Revenue and Police.

(A True Copy.)

W. H. MACNAGHTEN,
Secretary to the Government of India.

No. XXI.

The following Rules, passed by the Right Honorable the Governor of Bengal, under Act No. XXII of 1836, are published, as required by Sect. VII of that Act, for general information.

RULES FOR THE SUPERVISION AND PRESERVATION OF THE NAVIGATION OF THE CANALS SPECIFIED IN ACT No. XXII OF 1836.

Any person in charge of a Boat or raft neglecting or disobeying the following Rule, viz. That all Boats and rafts lying in the Balliaghatta and Circular lines of Canal be made fast by the head and stern alongside the bank to posts driven into the bank by the Superintendent, and in no other manner.

Any person in charge of a Boat or raft who shall let go an anchor, or place his Boat or raft in such a position as to endanger the safety of other Boats, or obstruct other Boats passing through any of the Canals specified in the above cited Act, any person who shall place obstructions in the Canals aforesaid, or on the roads, drains, or bridges, so as to impede a free passage along them, or to cause injury to them, or who shall commit nuisances by throwing filth on the banks, or into the Canals, or wilfully or negligently permit a Boat to sink in the Canals, will be liable to fine or imprisonment at the discretion of the Magistrate under Section VI of the Act aforesaid.

Any part of the fines imposed and levied by the Magistrate under the above Section may be given to the informer, at the discretion of the Superintendent.

Boats remaining in the Canals more than three months, without authority from the Collector, will be summarily removed.

But the Collector may grant permission to any Boat to remain in the Canals, without paying rent, under certain circumstances and conditions to be noted on the permit.

When a Boat may sink without any blame being attached to the person in charge of it, it will be the duty of the Superintendent of Canals to render every assistance in his power in recovering the Boat and property, without making any charge to the owner.

The Toll-keeper shall, without any unnecessary delay, deliver to any person tendering the amount of toll or rent for any Boat a receipt or ticket for the same, (according to a printed form,) and he will at the same time fill up a duplicate, which duplicates he will deliver to the Collector's peon from day to day.

If any person in charge of a Boat in the Canals shall refuse to show to the Collector his Ticket of admission into the Canal, or state that he has lost it, the Collector is autho-

rized to grant him a renewal of the Ticket, charging one-half toll for such renewal, and if the party cannot satisfactorily prove to the Toll-keeper, (or Collector on appeal,) the date of his entrance into the Canal, and the payment of toll, the renewed Ticket may be antedated one month.

In all disputes arising from trifling differences in measurement of Boats, the Toll-keeper shall decide in favour of the person paying the toll or rent.

1st November, 1836.

(Sd.) R. D. M.

Secretary to the Government of Bengal.

No. XXII.

No. 1588.

TO SECRETARY SUDDER BOARD OF REVENUE

Revenue.

Sir,

The 1st November, 1836.

I am directed by the Right Honorable the Governor of Bengal to request, that you will lay before the Board the annexed Copy of Para. 33, from a Letter addressed to Government by the Canal Committee, under date the 26th ultimo, in order to the introduction of a clause of the nature therein recommended in all future grants of Sunderbun Lands.

2. I am instructed to take this opportunity to inform you, that the Governor has been pleased to transfer from this date, the General, Fiscal, as well as Conservative Superintendence of the lines of Canal specified in Act No. XXII of the current year to the Military Board. Orders on the subject of actual transfer of charge by the Officiating Collector of the 24-Pergunnahs and Calcutta to Captain Thomson, have been issued direct from this Office to the Commissioner of Jessore

I am, &c.,

(Sd.) R. D. M.

[Secretary to the Government of Bengal.]

No. XXII. a.

(COPY.)

Para. 33—"Many of the natural Creeks of the line require tow-paths more urgently than the Canals, and the clearing away of the jungle on their banks is now frequently resisted by the Sunderbun Grantees, who leave a belt of jungle for the protection of their Bunds. The Superintendent will of course look to the mutual benefit of the land-owners and the navigators; but it would be well that all future grants should specify, that the bank of a navigated Channel should, for a certain breadth, be liable to occupation for the purposes of a tow-path or public road."

(A True Copy.)

Secretary to the Government of Bengal.

No. XXXV.

Extract—Letter to the Honorable the Court of Directors, under date the 15th May 1806, in the Revenue Department.

MISCELLANEOUS OCCURRENCES.

Para. 50. From Reports furnished by the Board of Revenue and by the Officer in charge

Consultation, 10th January 1805.
15th August 1805.
19th and 26th September 1805.
17th October 1805.
21st and 29th November 1805.
13th and 19th December 1805.

of the Engineer Department it appeared, that considerable repairs were required to be made to the Canal commonly known by the name of Tolley's Nullah, for the purpose of putting it in a good navigable condition, and that without such repairs, it was to be apprehended, that the navigation

of the Nullah would, in the course of a short time, be entirely obstructed. The execution of the work was of great importance, not only on account of the Revenue, which Government draws from the Nullah by means of the Toll levied on Boats passing through it, but likewise on account of the convenience which the community derive from this Channel of communication with the Ganges, and the Rivers to the Eastward.

51. The Vice-President in Council accordingly resolved, that the necessary excavations and other repairs should be made to the Canal. It was at the same time determined, that the work should be performed under the immediate directions of the Surveyor to the Magistrates of Calcutta and its vicinity, subject to the general superintendence and controul of the Magistrate officiating in the 24-Pergunnahs.

52. The above-mentioned Officers were accordingly directed, on the 29th of November last, to commence the work, submitting a General Estimate

15th May 1806.

of the expence which would be required for that purpose.

The Surveyor was at the same time authorized to draw a Salary of Rs. 300 per month for his services in the performance of that duty.

53. The Estimate required is recorded in the Proceedings of the 13th December last.

Miscellaneous.
13th December 1805.
Miscellaneous.
29th November 1805.

From a reference to that document your Hon'ble Court will observe, that the computed expence of the excavations and other repairs, founded on the Survey made by the Engineer Officers, amounted to Rs. 1,03,440-7, a sum considerably less

than that at which the expence had been estimated by the Officer in charge of the Engineer Department.

54. In order to render the expence to Government as light as possible, the Magistrate was not only directed to employ the convicts in the vicinity of Calcutta in the execution of the work in question, but [an] order was likewise issued for bringing to Calcutta an additional number of convicts for that purpose. By these means it was supposed, that the expence of the repairs might be reduced to nearly half the amount which would otherwise have been required. The Magistrate was accordingly authorized to disburse the sum of Rs. 51,720 in making the repairs, being a moiety of the sum above specified.

55. The repairs are not yet completed; but at the suggestion of the Magistrate, in a

15th May 1806.
Miscellaneous.
Consultation, 8th May 1806.

Letter recorded in the Proceedings of the 6th of May, we have ordered a survey of the present state of the Nullah, and a report upon the progress made in the projected improvements.

The subject will accordingly be revived in a future Dispatch, when we shall have the honor of stating to your Hon'ble Court the actual expence incurred in the execution of this useful and necessary work. We doubt not that we shall at the same time be able to inform you of a considerable increase in the Revenue derived from the Tolls levied on Boats, in consequence of the improvements made in the navigation of the Nullah.

No. XXXVII.

Extract—Letter to the Honorable the Court of Directors, dated the 29th of June, 1826.

Para. 147. In the 8th Paragraph of our Financial Letter, dated the 31st December 1824, we informed your Honorable Court, in general terms, that, adverting to the heavy pressure upon our Finances, which the war had induced, we had resolved upon the discontinuance of such Public Works as were likely to be productive of any considerable disbursement, unless in those cases where peculiar circumstances should appear to require a partial or total departure from the general rule.

148. This being premised, we shall proceed, in the first instance, to bring to the notice of your Honorable Court the proceedings of the annexed dates, as explanatory of the progress made in two important Departments of Public Works, up to the date of the Resolution in question, and of the measures consequently taken.

149. In the 228th and following paragraphs of our Dispatch, dated the 30th of July, 1823, we informed your Honorable Court that we had constituted a Committee for the general management and controul of the construction of the Canals upon which we had resolved to commence in the vicinity of the Presidency, and of the manufacture of Iron Suspension Bridges; and that we had appointed Captain Schalch, the Executive Officer, for the immediate superintendence of these works, subject to the instructions and orders of the Committee.

150. We beg to refer your Honorable Court to the Proceedings of the annexed dates for information with regard to the progress made in these works by Captain Schalch, previously to the employment of that Officer in duties of a Military nature, and his subsequent departure for the South-eastern Frontier.

151. Early in the year 1824, as your Honorable Court will observe from the Proceedings of the dates noted in the margin, we found it necessary to afford Captain Schalch some assistance in the Iron Bridge Department, and we accordingly appointed Lieutenant Baker of the Artillery, his Assistant, with an allowance of Rupees 500 per mensem, and further, authorized him to retain an European Overseer upon a monthly Salary of Rupees 200. We also authorized the following Establishment:

Rev. Couns.	31st October 1823, No. 22.	An Assistant, ..	100 0 0
" "	24th December " " 25.	An Overseer (Subordinate), ..	60 0 0
" "	17th January 1824, " 15.	House-rent, ..	60 0 0
" "	12th March " " 28.		
" "	30th April " " Nos. 24 to 29.		
" "	19th September " " 36 and 37.		
" "	26th Ditto " " 11 and 12.		

152. Your Honorable Court will observe that up to the close of 1824, no further progress had been made in the Channel Creek and Diamond Harbour Canal than con-

sisted in surveying and ascertaining the several levels of the country through which it was proposed that the intended line should pass. But the plans and other documents abundantly demonstrate, that the scheme proposed by Captain Schalh is easily feasible, and that the expence, consequent to the undertaking, will not exceed the anticipated amount.

153. In the Eastern Canal some progress had been made in the actual construction of the Work. But Captain Schalh experienced considerable disappointment from the difficulty with which labourers were obtained for the purposes of excavating the soil or clearing the jungle, the indolence of the small number obtainable, and the unusual severity of the rainy season of 1823, which, with reference to the low part of the Soonderbuns to which his operations were principally confined, was a circumstance peculiarly unfavourable. All these impediments, however, appeared to have been satisfactorily surmounted by the zeal and personal activity of Captain Schalh, when His Excellency the Commander-in-Chief required the services of that Officer and of his Assistant Lieutenant Prinsep in the field; and the considerations referred to in Paragraph 147, forbade us to incur any considerable expence in the prosecution of this undertaking. Still we were anxious that, as the Committee had suggested, the original plan should be prosecuted to such an extent as to ensure the early formation of a navigable Channel through the Salt-water Lake, but we were unable to procure a person, out of your service, properly qualified to conduct operations, even upon the modified scale proposed. We were, consequently, compelled, however reluctantly, to determine upon the temporary abandonment of the Canal, which we had anticipated would place the navigation between this City and the Ganges beyond the power of accident or season, and would also open a highly desirable line of communication with the Eastern Districts, and the Forests of the Soonderbuns.

154. Of the Iron Bridges some appeared to be indispensably required. The workmen who had been trained with much trouble, would, if dismissed, have been dispersed, so that we should have lost the benefit of the experience that they had acquired: and adverting to the circumstance that the services of Lieutenant Baker were still available in his Civil capacity, we determined, at the earnest recommendation of the Committee, to keep up the Establishment belonging to the Iron Bridge Yard, and proceed to finish such Bridges as had already been commenced upon.

155. We observe with regret that the expences attendant upon the construction of the piers for the Iron Bridge at Kidderpore have exceeded the Estimate in the sum of Rs. 11,728, but when the unlooked-for difficulties with which Captain Schalh had to contend in the peculiarly unstable nature of the soil, (owing to the site of the work having, at a distant period, been the bed of the Hooghly,) the consequent necessity of sinking shafts to a great depth, and laying the foundation finally, at that distance from the surface, upon wooden piles, as well as the alterations authorized subsequently to the construction of the work, are taken into consideration, we must acquit that Officer of all blame; although in addressing the Committee upon the subject we took the opportunity of impressing upon them the utter worthlessness of estimates, if widely at variance with the actual expence of work. The necessity however for the construction of a Bridge at Kidderpore was such, that we could not have hesitated to undertake it, even had we known, from the outset, that the expences incident to the operation would greatly exceed the sum actually disbursed. We also deemed it expedient to direct that the Bridges under the preparation for the Cuttack Road should be completed and forwarded.

156. The aggregate expence incurred on account of the different works subject to Captain Schalh's superintendence from the commencement of the undertaking to the 31st

Rev. Cons. 24th Dec. 1824, July 1824, when the services of that Officer were required in the No. 20. Military Department, are as follows :—

The new Eastern Canal,	1,31,895	0	0
The Diamond Harbour Canal,	10,592	0	0
The Ballinghat Canal,	5,966	0	0
The Iron Bridge Department,	84,023	0	0
The Work Yard,	16,585	0	0
Purchase of Land for the new Eastern Canal,	1,08,306	0	0
Charges of the Committee's Establishment,	18,020	0	0
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Total Rupees	3,75,387	0	0

157. The above abstract includes charges of every description. From the first item is to be deducted a sum of Rupees 30,807 on account of five Dredging Boats constructed under Captain Schalch's superintendence for the purposes of the Canal, and subsequently transferred to the Military Department. The same item also includes an outstanding Balance of Rupees 15,844 remaining to be worked off by the workmen employed on the Eastern Canal.

158. Captain Schalch had, your Honorable Court will observe, carried the Canal nearly three miles, at an aggregate expence of Rupees 85,243, giving an average of Rupees 28,414 per mile; and although this charge greatly exceeded the estimate (10,000 Rupees per mile) the difficulties inseparable from the commencement of a novel and arduous undertaking had been overcome, and in the latter stage of operations, the work was conducted within the estimated rate.

159. The Bills submitted by the Committee, and have been passed by us in the Canal and Iron Bridge Departments, including the expence incurred in fitting up a Dredging Boat, are as follows :—

Rev. Cons. 13th February, 1824, Nos. 27 and 28.	Bills Nos. 1 to 40, in the Canal	
" " 12th March, " " 36 and 37.	Department, Rupees	94,596
" " 9th April, " " 32	Bills Nos. 1 to 38, in the Bridge	
" " 7th May, " " 56 and 57.	Department,	74,663
" " 4th June, " " 14 and 15.	Bills Nos. 1 to 12, in the Yard	
" " 23rd July, " " 15 and 16.	Department,	17,104
" " 26th Nov. " " 13 to 16.		
" " 10th Dec. " " 23		
" " 18th Sept. 1823, " " 25		
" " 9th Oct. " " 29 and 30.		
" " 5th March, 1824, " " 43 and 44.		
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		1,86,363

160. It appears to us with reference to the items of the Bills connected with the Iron works, and the heavy general expences inseparable from operations of that nature in this country, that your Honorable Court might be able to procure in England all the Iron works requisite for Suspension Bridges, (which might be forwarded to India in a state ready for immediate erection,) at a smaller present expence, of infinitely superior manufacture, and, consequently of greater durability, than we have been able to command, although heavy charges have been incurred, and the zealous exertions of very able Officers have been directed to the task. It is a singular fact, that whilst the daily wages of handicraftsmen in this country are greatly inferior to those which workmen of the same description obtain in England, the very reverse is the case with respect to piece-work, which the best carpenter or smith in London would undertake at a lower rate, than that at which a workman in Calcutta is willing to engage. Between the quality and workmanship of such articles, and all indeed of a coarse and heavy description wrought in England and Bengal, there can be no comparison, and we would therefore submit to your Honorable Court (whose means of information upon the subject must be infinitely superior to any that we can pretend to possess,) whether the transmission from England of the material, and the expence of the construction of the

